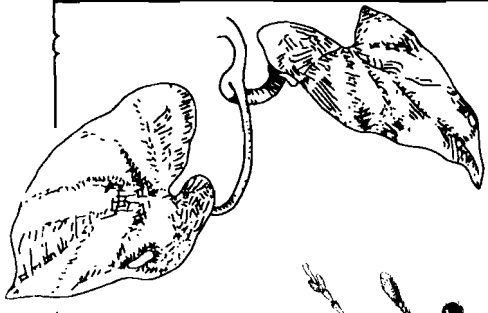
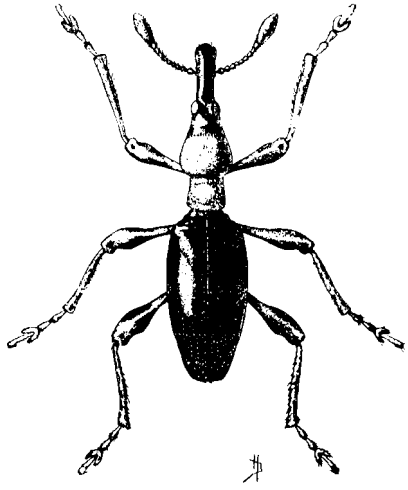
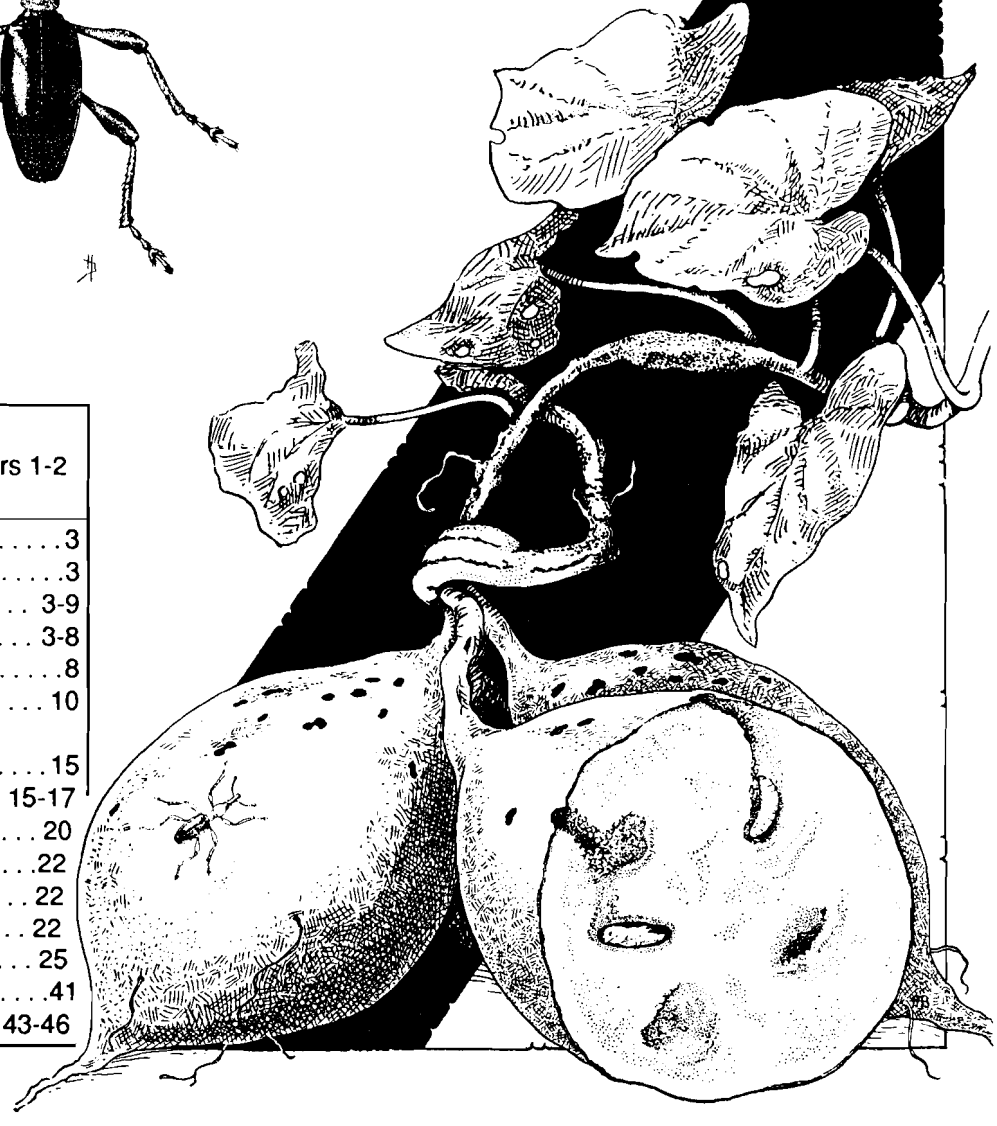
CALIFORNIA PLANT PEST and DISEASE REPORT

California Department of Food and Agriculture 1220 N Street, Sacramento, California 95814



The SWEETPOTATO WEEVIL





What's Inside:

Vol. 12 Numbers 1-2
January-May, 1993

CALIFORNIA PLANT PEST AND DISEASE REPORT

Editor: Raymond J. Gill
Production Assistant:
Brenda R. Beckwith

The editor acknowledges the contributions of numerous individuals within this department, without whose cooperation and assistance this project would not be possible.

Funding for this publication is provided through the Cooperative Agricultural Pest Survey, Special Project #44
USDA-APHIS-PPQ

Correspondence concerning the CPPDR or subscription requests should be addressed to:

Editor, CPPDR
State of California
Department of Food and Agriculture
Analysis and Identification Branch, Rm. 340
1220 N Street
P. O. Box 942871
Sacramento, CA 94271-0001

The California Plant Pest and Disease Report, Volume 12, Numbers 1-2, was issued on May 31, 1993 and printed July 1993.

ENTOMOLOGY HIGHLIGHTS

SIGNIFICANT FINDS

ORIENTAL FRUIT FLY, *Bactrocera dorsalis,* -(A)- In the first part of 1993 there were two Oriental fruit fly finds in California. On March 25, John Sarmiento found a male fly while inspecting a trap in a tangerine in Ontario, **San Bernardino** County. Rog Rice also found a male in a Jackson/ methyl eugenol trap in a lemon tree in Los Angeles, **Los Angeles** County on May 6.

MEXICAN FRUIT FLY, *Anastrepha ludens,* -(A)- Returning to last year briefly, a female Mexican fruit fly was found in San Ysidro, **San Diego** County, in a lemon tree by Newlen Sutton on December 23. Sutton also found a male and another female in sapotes at San Ysidro on February 10 and March 18, respectively. On April 12, Muluneh Wube found a male fly in a McPhail trap in an orange tree, San Diego, San Diego County. Later in the month, Roberto Sanchez found an unmated female fly in a McPhail trap at a residence in Chula Vista, San Diego County, on April 20. On April 21, Efren Beguico found a trapped male fly in a loquat tree in South Gate, **Los Angeles** County. Emelina Liscano found a trapped unmated female in a fig tree on April 29 in San Diego. Finally, trapper Anita Pecina found fragments of a fly in a McPhail trap that had been placed in a orange tree in Chula Vista, San Diego County.

VARROA MITE, *Varroa jacobsoni,* -(A)- Two recordings of varroa mites have occurred so far this year. The first of the finds was by Doug Mattes at Peters, **San Joaquin** County, on January 13. The second was on March 19 by Stan Maggi in San Jose, **Santa Clara** County.

NEW STATE RECORDS

SWEETPOTATO WEEVIL, *Cylas formicarius elegantulus,* -(A)- This weevil, for many years a serious pest of sweetpotatoes in the southern United States and Hawaii, was recently discovered in a storage shed in central California. Further delimitation resulted in finds in other storage facilities in the same area. The following report by Dick Penrose and Steve Brown of CDFA outlines the finds and subsequent Department responses:

> Adults of the sweet potato weevil, *Cylas formicarius elegantulus* (Summers) were recovered from California-grown seed potatoes at a Livingston area warehouse on February 16, 1993 by Merced County Agricultural Biologist Robert Aguilar and Deputy Agricultural Commissioner Dan Cismowski. Specimens were confirmed by Senior Insect Biosystematist Terry Seeno on the same date.
>
> A preliminary delimitation survey conducted by county, state, and federal personnel, which consisted of visual inspections and pheromone trapping of all known packing sheds, storage facilities, "hot rooms," etc. in the three major sweet potato producing counties, resulted in the collection of adults at four additional sites. Three of these are located in Merced County, the

other in Stanislaus County. The decision as to whether or not it is appropriate to attempt eradiction of sweet potato weevil will be dependent upon the results of the delimitation activities performed this season. There is no intent to drop the Sweet Potato Weevil Exterior Quarantine or change the entry requirements until the results of the delimitation activities are obtained and evaluated.

Based on these preliminary finds, and the growers expressed support for eradication (if feasible), the following actions have been taken:

1. The Department has placed an Interior Sweet Potato Weevil Quarantine on Merced and Stanislaus Counties.

2. All sweet potato growers and packing houses in Merced and Stanislaus Counties will enter into compliance agreement with their respective agricultural commissioner's offices. The compliance agreement will provide for trapping to delimit the pest's distribution and specifies the minimum requirements which must be met to allow movement of sweet potato roots within and outside of the quarantine area.

3. Several Special Local Need and Section 3 registrations are being pursued for chemical treatments needed to control weevils in storage facilities and propagative and production areas.

4. A survey of all commercial sweet potato growing regions, including both plant beds and production fields, will be conducted using a pheromone/trap system available through AgriSense. Counties targeted for this 1993 survey are: Merced, Stanislaus, Fresno, Kern, San Bernardino, and San Diego.

5. Research monies have been allocated to conduct laboratory evaluation of the reservoir potential of certain California "weed" species in the family Convolvulaceae (morning glories).

While the above report covers the departmental response to the finds of this weevil in the most important sweetpotato growing areas of California, the following information covers some of the more basic information dealing with this pest introduction problem. The information is a compilation of information about the sweetpotato weevil which has been developed from the references cited on page 7 of this report.

Sweetpotato production harvested from 6,411 acres in California was valued at $23,735,000 in 1985. During that year the producing counties in order of importance were Merced, Stanislaus, Fresno and San Bernardino. In the past sweetpotato production has also occurred in Tulare and San Diego Counties.

The sweetpotato weevil is a rather striking insect, with a thin, ant-like appearance. It is a reddish-brown color with the head and wing covers a dark shiny blue, green or purple. It is approximately 1/4 inch long. The illustrations on page 5 indicate the structure of both the adult beetle and the immature stages.

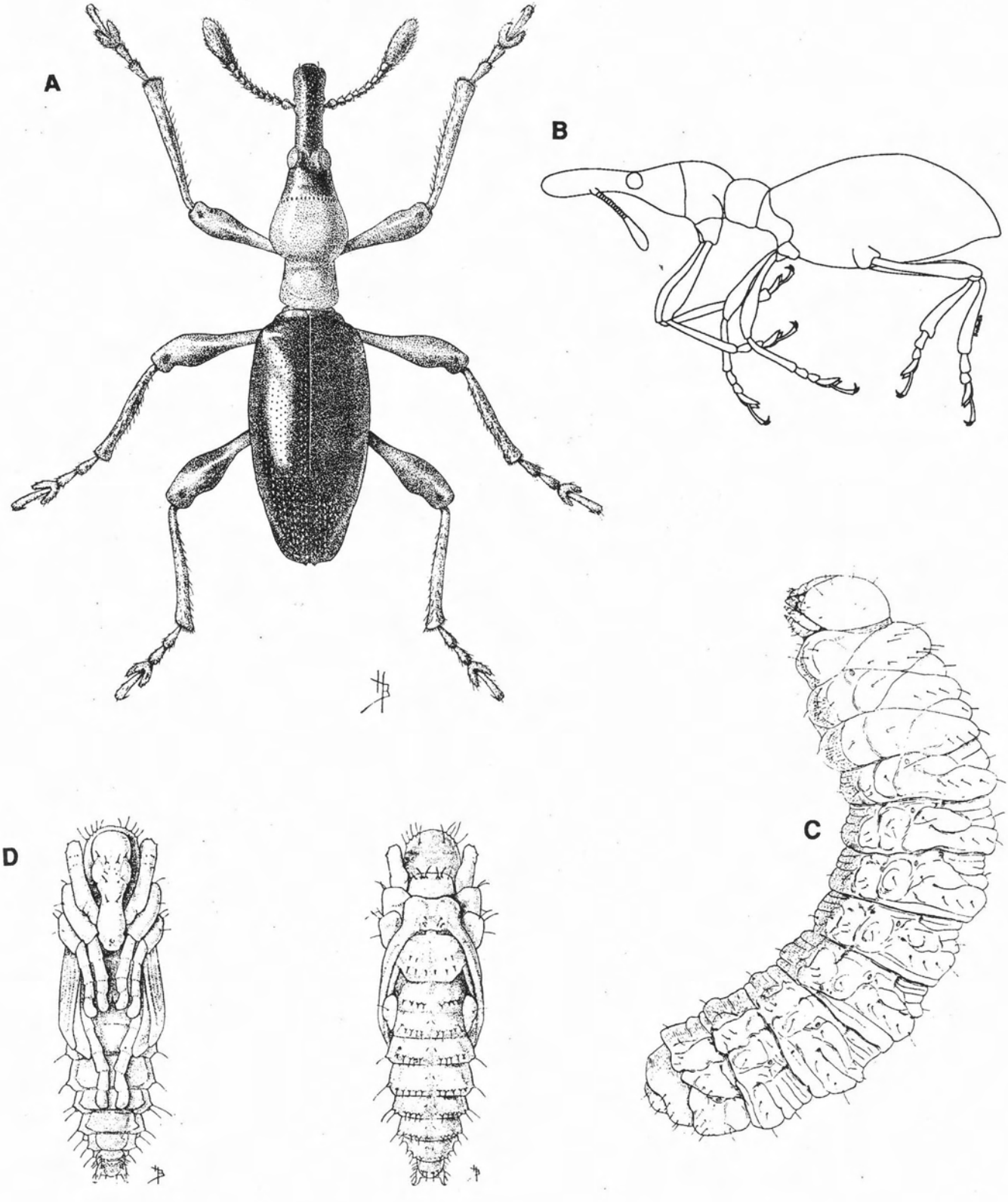


Fig. 1. The sweetpotato weevil, *Cylas formicarius elegantulus*. A. adult weevil from dorsal perspective. B. Adult weevil, lateral outline. C. Lateral view of the mature larva. D. Pupa, ventral view. E. pupa, dorsal view. Illustrations above and on front cover taken from Cockerham, 1937.

The sweetpotato weevil is native to India or possibly Malaysia. It belongs to a species complex containing approximately 25 valid species in three major species groups and several other slightly different, non-economic species. All of the species are very similar morphologically and difficult to separate. The genus is apparently a very old one, with the common ancestor to the three groups within the genus *Cylas* probably being present in the mid-Jurassic period approximately 150 million years ago. The generic group containing the sweetpotato weevil and two other non-pest species was separated from the other two main groups in the genus when the Indian subregion split off from Africa in the mid- to late Cretaceous period, approximately 90 million years ago. All of the species other than *C. formicarius* are generally still restricted to their native habitats and all feed on various species of the Convolvulaceae and Cuscutaceae. Several species in Africa and Madagascar are important pests of various species of sweetpotato and convolvuloids in those habitats. However, it is believed that when the sweetpotato species *Ipomoea batatas* was introduced into India from the New World sometime around the early 16th century, *C. formicarius* readily adapted to it. After the adaptation the weevil was then transported to various parts of the globe, including the United States. The weevil was probably introduced into the new world sometime around the mid 19th century, and was first recorded in the United States at New Orleans in 1875 The sweetpotato weevil strain (*Cylas formicarius elegantulus*) that occurs presently in the United States also occurs at least in the following countries: Argentina, Bahamas, Barbados, Brazil, Guyana, Cuba, Curacao (Dutch West Indies), Dominican Republic, Guatemala, Haiti, Honduras, Jamaica, Mexico, Panama, Puerto Rico, Lesser Antilles, Venezuela and the Virgin Islands. The Old World strain (*Cylas formicarius formicarius*) occurs throughout most of subtropical Europe, Asia, the South Pacific and the more coastal locations of eastern Africa.

The sweetpotato weevil is a serious pest of sweetpotatoes practically everywhere that this crop is grown. It is a formidable pest of sweetpotato in tropical countries, and has caused as much as 60 to 100 percent loss in some areas. Crop losses in the Hawaiian Islands have been estimated at about 10 to 20 percent. It currently infests parts of seven southern states: Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina, and Texas. In Florida, the weevil has nearly eliminated commercial sweetpotato production.

The weevil can live and multiply in sweetpotato fields, in stored sweetpotatoes, and in certain fleshy-rooted morning-glories and in the pantropical plant *Ipomoea pes-caprae* (railroad vine) that grows wild along the South Atlantic and Gulf coasts. Most sweetpotato weevil damage is caused by the larvae as they feed on the sweetpotato tubers. Even a lightly infested sweetpotato is unfit for consumption because of the presence of the larvae and because the larvae induce the formation of bitter terpinoids. In a severe infestation, hundreds of larvae may feed on one sweetpotato. The feeding of larvae and adults on aboveground parts of the plant apparently does not damage the plant enough to reduce yield.

The most damaging infestations occur in areas where winters are not cold enough to destroy all vegetation on which the weevil feeds. In these areas the weevil can breed throughout the year. Heavy infestations occur every year in areas near the South Atlantic and Gulf coasts.

A generation is produced in one month to six weeks in warm weather. In cool weather the weevil develops more slowly. Generations succeed one another as long as the weevil has food. In areas along the South Atlantic and Gulf coasts six to eight generations may be produced in one year.

The female adult lays eggs in shallow feeding punctures made in mature parts of the sweetpotato vine, in the plant stem near the soil, in the roots, or in stored sweetpotatoes. Eggs are white and so small they cannot be easily seen. They hatch into larvae in about one week in warm weather. The larva grows to about three-eighths inch long. It is white at first, later becomes cream colored. Its head is pale brown. As the larva feeds it burrows into the stem or root, making a tunnel that becomes larger as the larva grows. In two or three weeks (or longer during cool temperatures) the larva transforms into a pupa. The pupa is slightly smaller than the mature larva. Its partly developed snout, legs, and wings can be plainly seen, and it has conspicuous eyes. Legs and wings lie folded against or around the body.

In a week or longer the pupa turns into an adult weevil. The adult emerges through a hole about the diameter of a match stick. It feeds on vines, stems, and roots. Adults may live as long as eight months. They become inactive at low temperature, then active again when the temperature rises. Adults have been known to fly over a mile in search for food. They probably can fly longer distances. They are seldom seen in flight, however, as long as food is plentiful.

Detection of weevil infestations can be made without cutting into sweetpotato plants and without slicing the sweetpotatoes. The punctures made by egg-laying females and the feeding punctures made by adults of both sexes are a sign of infestation. They are usually in clusters.

Young larvae in a potato begin their tunneling in the punctured area of the tuber, just beneath the skin. In punctured tubers, the the tunnels become larger as they extend inward. Each tunnel contains a larva or pupa unless the insect has completed its cycle in the potato and has emerged. Exit holes are another sign of infestation. The main stems of weevil-infested sweetpotato plants become enlarged and pale. If stems that have this appearance are split, larvae or pupae (or both), tunnels, and excrement will probably be found. As mentioned above, pheromone traps are available.

References:

Anonymous, 1958: The sweetpotato weevil, how to control it. U.S. Dept. Agric. Leaflet 431: 1-8.

Austin, D. F., 1990: Associations between the plant family Convolvulaceae and *Cylas* weevils, in: Sweetpotato Pest Management: a Global Perspective. (eds. Janson, R. K. and K. V. Raman), Boulder Colo., Westview Press. pp. 45-57.

Austin, D. F., R. K. Jansson and G. W. Wolfe 1990: Convolvulaceae and *Cylas*: a proposed hypothesis on the origins of this plant/host relationship. Tropical Agric. (Trinidad) 68(2):162-170.

Cockerham, K. L., 1937: The sweetpotato weevil, how to control it. U.S. Dept. Agric Leaflet 121: 1-6.

Cockerham, K. L., O. T. Dean, M. B. Christian and L. D. Newsom, 1954: The biology of the sweetpotato weevil. Louisiana State Univ. Tech Bull. 483: 3-30.

Muruvanda, D. A., J. W. Beardsley and W. C. Mitchell, 1986: Additional alternate hosts of sweetpotato weevils *Cylas formicarius elegantulus* and *Euscepes postfasciatus* (Coleoptera: Curculionidae) in Hawaii. Proc. Hawaiian Entomol. Soc. 26: 93-96.

Sherman, M. and M. Tamashiro, 1954: The sweetpotato weevils in Hawaii, their biology and control. Univ. Hawaii Agric. Exper. Sta. Tech. Bull 23:1-36.

Wolfe, G. W., 1990: The origin and dispersal of the pest species *Cylas* with a key to the pest species groups of the world. , in: Sweetpotato Pest Management: a Global Perspective. (eds. Janson, R. K. and K. V. Raman), Boulder Colo., Westview Press. pp 13-43.

The following chart outlines the places and times of the recent California collections of the sweetpotato weevil during the initial surveys:

COUNTY	CITY	DATE	HOST	COLLECTOR
Merced	Livingston	2/16/93	Sweetpotato	Aguilar
Merced	Livingston	2/17/93	Sweetpotato	Bingham
Stanislaus	Turlock	3/05/93	Sweetpotato	Sandoval
Merced	Livingston	3/11/93	Sweetpotato	Morris
Merced	Livingston	3/15/93	Sweetpotato	??
Merced	Livingston	4/08/93	Sweetpotato	Miller/Sanchez
Merced	Atwater	4/14/93	Trap	Miller/Sanchez
Merced	Atwater	4/15/93	Trap	Miller/Sanchez
Merced	Atwater	4/16/93	Trap	Miller/Sanchez

NEW STATE RECORDS (continued)

URBAN SOFT SCALE, *Pulvinaria urbicola,* -(Q)- The urban soft scale is one of a group of soft scale genera and species in the family Coccidae often called cushion bearers that produce a conspicuous, white, elongated ovisac. This scale is common in Hawaii and Florida, and it is occasionally intercepted on incoming plant materials from these locations. It occurs in other tropical areas of the world, especially in the Caribbean, Central America, Micronesia and the South Pacific.

On March 22, Neil Stalnaker collected this scale from an ornamental tree growing in El Cajon, **San Diego** County. The tree was a very large, multi-trunked specimen of bellesombre, *Phytolacca dioica.* The scale was occurring in a medium population on the leaves of the tree. Subsequent surveys by county officials failed to find evidence of infestation on any other nearby vegetation. Later observations this spring revealed that most of the ovisacs had been attacked by some type of predator, probably a lady beetle, but how much the overall population will maintain itself because of this is not known at this time. Also, a chemical treatment and severe pruning by the property owner may also help to eliminate the infestation.

The collection is the first positively confirmed record of this insect in California outside of a nursery or quarantine situation. However, in 1965, specimens of what appear to be this scale were collected by R. Buckner and R. Roberson from *Lantana* at the San Diego Presidio. Of these three specimens, two seem to match *P. urbicola* morphologically, but the third specimen does not. Also since we do not have exact information concerning the host plant, where it came from, and how long it had been there, we have not considered the 1965 find as the first official record.

The scale has a wide host range, but is not otherwise as prevalent as the commonly encountered green shield scale, *Pulvinaria psidii.* It has not been mentioned much as a pest in the literature, but has previously caused injury to guavas in New Guinea. Like green shield scale, it has the potential to be a pest, particularly because of honeydew production and the unsightliness of the ovisacs. Very little is known about its biology, particularly the number of yearly generations.

Morphologically, this species is close to *P. floccifera,* which occurs in California, but *P. urbicola* lacks the submarginal duct tubercles that are normally present in *floccifera* (see Fig.2).

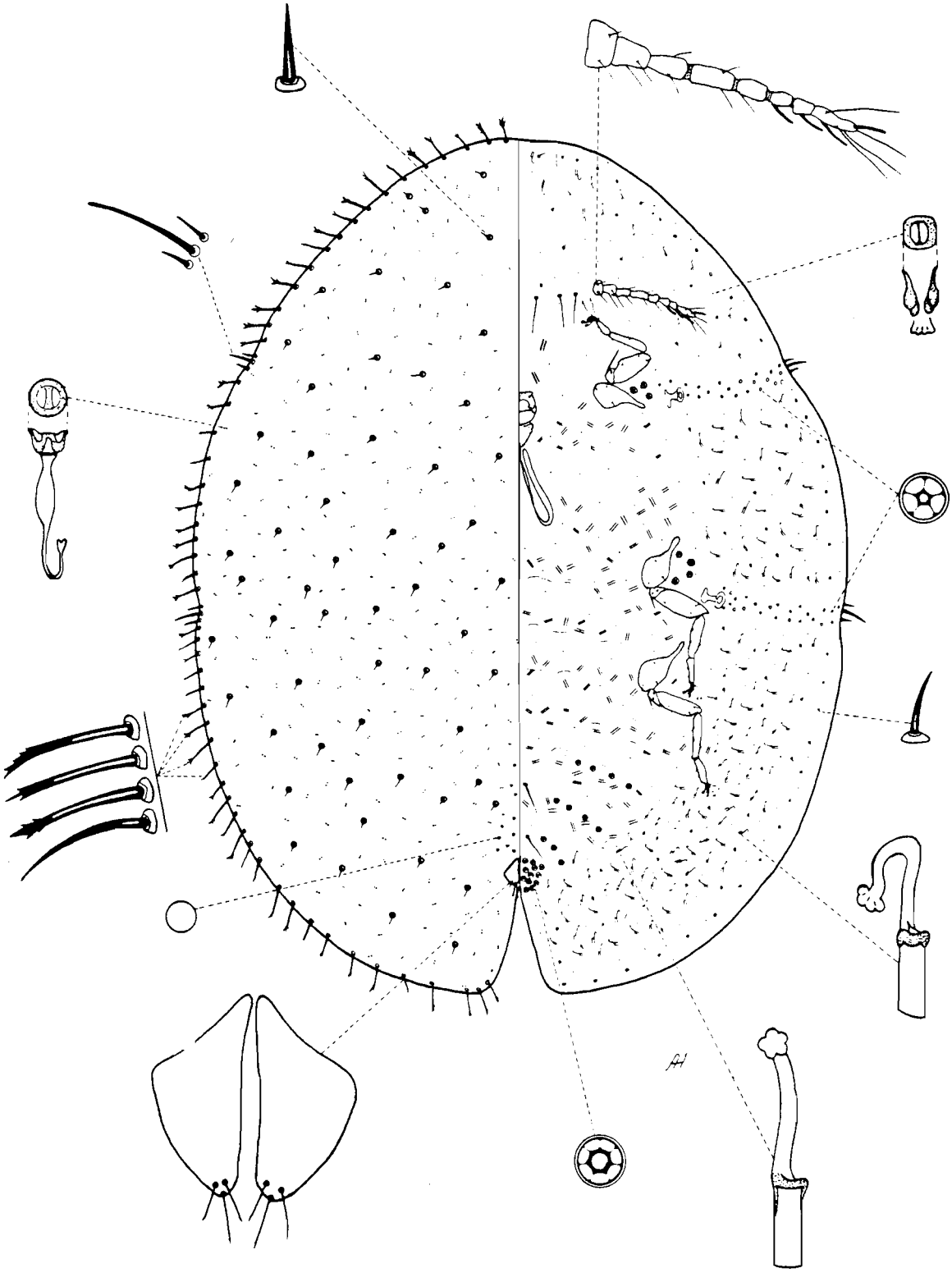


Fig. 2. Urban soft scale, *Pulvinaria urbicola*. Morphology of adult female. Illustration courtesy of Avas Hamon, 1984: Soft scale insects of Florida.

NEW COUNTY RECORDS

Several homopterous insects and a dipteran have been collected in new county locations during the first part of 1993. The following reports outline the finds:

KUNO SCALE, *Eulecanium kunoense,* -(B)- This soft scale, of Asian origin, has been in California at least since 1894, when it was collected at Temescal, Alameda County. In 1944 it was found in Contra Costa County. These two counties were the only known localities for the scales for many years. However, in recent years the scale has begun to move steadily to new locations. This spring, it has been found in two new counties. On April 9, the scale was collected for the first time in **Tehama** County at Corning. The collection was made from a commercial prune orchard by Agricultural Biologist David Stoffel. On April 15, the scale was collected from a plum tree in a residential garden at Redwood City, **San Mateo** County by Agricultural Biologist Kyra Kingore. The scale was first found in **Sacramento** County in 1978, but the original infested plants were removed and it was thought that the infestation had died out. However, on April 26, Keith Miller of Sacramento County relocated the scale several miles from the original infestation.

Kuno scale is an unusual appearing soft scale, with nearly spherical proportions in the mature adult female. The mature coloration is dark chestnut brown, although the young adult females before egg laying are a striking mixture of reds, yellows, and browns. Male scales are very plentiful in the populations, something that is uncommon in most soft scales that occur in California. The males are readily noticeable in the spring while in the crystalline white puparia or cocoon stage.

The scales can build up heavy populations on the preferred hosts, primarily perennial plants in the rose family, particularly plum and cotoneaster. Fortunately there is only one yearly generation, which prevents the scale from becoming a critical pest species. The scales so far have not been a problem in commercial orchards since most of the known infestations have been in residential neighborhoods. However, the scale does have potential for being a commercial orchard problem, and this may become apparent in the Tehama County infestation. The current distribution now includes the counties of Alameda, Butte, Contra Costa, Lake, Napa, Sacramento, San Joaquin, San Mateo, Santa Clara and Tehama. An illustration of the habit of this scale will be found below.

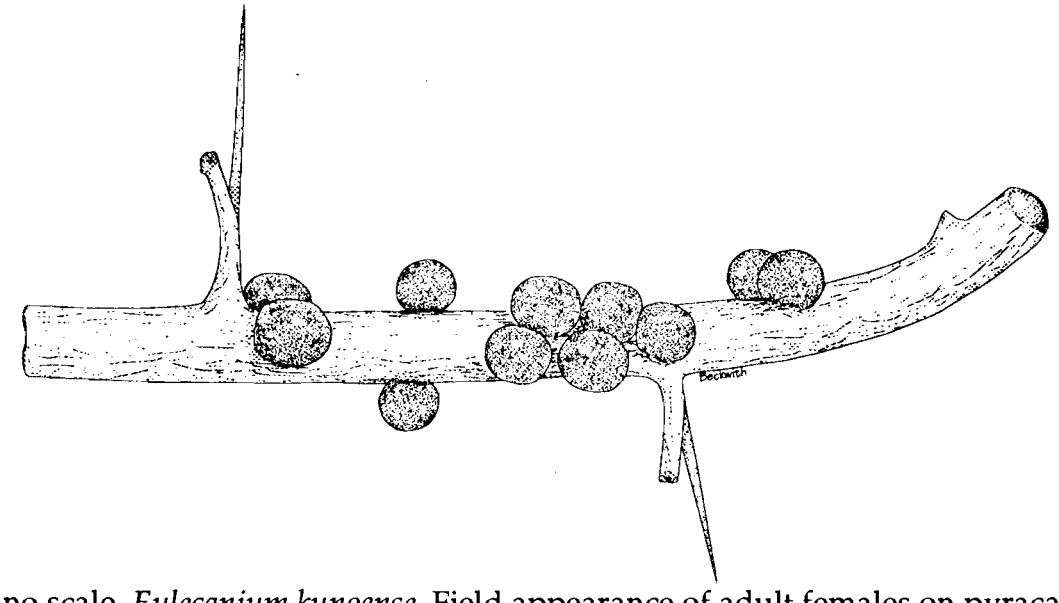


Fig.3. Kuno scale, *Eulecanium kunoense.* Field appearance of adult females on pyracantha twigs.

ASH PSYLLID, *Psyllopsis fraxinicola,* -(C)- This psyllid had been recorded from California many years ago but had never been recollected since that first collection in the 1920's. However, in 1987 the species resurfaced at Vacaville, Solano County (for morphological and more historical information see CPPDR 6[1-2]:9-10, 9[3-4]:137 and 10[1-2]:12). Then later on it was found in Alameda and Santa Clara Counties. Whether these recent finds were new introductions probably never will be known.

The psyllid has now been found in yet another county. It was collected at Manteca, **San Joaquin** County from Raywood ash on April 30. The collection was made by Ed Maze and Kirby Brown.

EUROPEAN VIOLET LEAF MIDGE, *Dasineura affinis,* -(Q)- Back on December 10, a European violet leaf midge was found for the first time in Santa Cruz, **Santa Cruz** County, on violets by William Chaney of U. C. Extension.

COTTONY MAPLE SCALE, *Pulvinaria innumerabilis,* -(C)- Another cottony ovisac producer, this scale has been in California for many years, although it is usually rare and seldom seen. It is most frequently encountered in grape vineyards in the northern part of the San Joaquin Valley. A habitus drawing of the scale is included below.

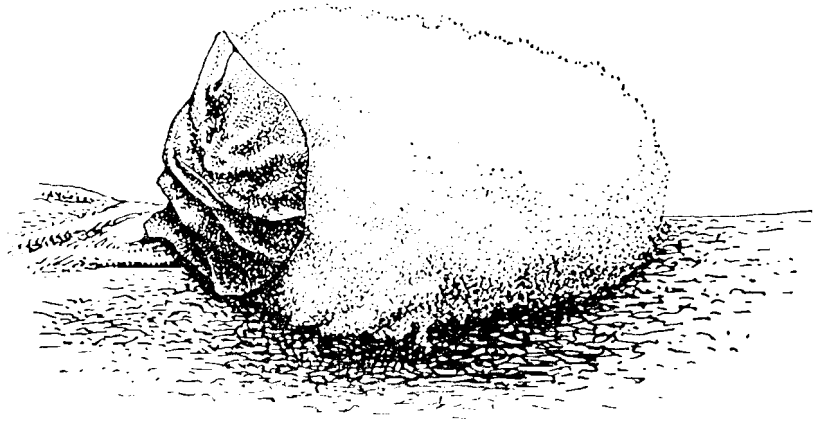


Fig. 4. Cottony maple scale, *Pulvinaria innumerabilis.* Generalized field appearance of adult female. Illustration adapted from *Pulvinaria rhizophila* in Borchsenius, 1957, Fauna of USSR (Coccidae).

EXCLUSION

Numerous rated scale insect species have been discovered in California nurseries during the first few months of 1993. Following is a record of these detections:

CYCAD POLIASPIS SCALE, *Poliaspis cycadis*, -(Q)- Specimens were collected from a nursery in Brea, **Orange** County on February 23 by James Wynn on *Cycas* sp. (not *C. revoluta*). The scale was initially identified by Orange County Entomologist Nick Nisson. The scale is rather uncommon in the United States, and, in fact was not even represented in the CDFA scale insect collection. The plants in the nursery supposedly came from a private collection of cycads that was being dismantled. The exact location of this private collection is unknown at this time, although it is reputed to be in southern California. Therefore this may represent a new state record for the scale, but this cannot be proven until it can be determined whether other plants are still infested in or near the remains of the private collection.

Previously, the scale was known only from the the United States at a greenhouse in Washington DC. Elsewhere it is known from greenhouses in Europe, and from India and Asia. Its known hosts are *Cycas* spp., *Dioon edule*, and *Microzamia* spp. The scale has a white, oystershell-like scale cover, but is otherwise very similar to the common cycad scale, *Furchadaspis zamiae*. This species differs morphologically from cycad scale in having an elongate body shape and multilocular pores, which are absent in *zamiae*. Illustrations of the morphology and habitus of the scale are included in Fig. 5. Nothing is known about the biology or economic potential of this species.

RED WAX SCALE, *Ceroplastes rubens*, -(A)- Once under eradication in the continental United States, this soft scale species appears to be increasing its populations in greenhouses. It is commonly intercepted now on nursery stock and other plant materials from Florida and Hawaii. It has been found in two California greenhouses. It was collected from neanthebella palms at a nursery in Whittier, **Los Angeles** County by Limon and Banta on January 20. It was later intercepted by Richard Schaffer on March 22 at Indio, Riverside County on ferns (*Microsorium elegans*) which were being shipped from a nursery in Los Angeles, **Los Angeles** County.

COCKERELL SCALE, *Lopholeucaspis cockerelli*, -(A)- This armored scale was collected from a nursery at Carpinteria, **Santa Barbara** County on March 26. The collection was made on raphis palms by Susan Squires and Jerry Davidson.

COCONUT SCALE, *Aspidiotus nerii*, -(A)- Another armored scale, this pest of many tropical ornamental plants was collected at the same time as the Cockerell scale listed above.

ALAZON MEALYBUG, *Dysmicoccus alazon*, -(B)- This mealybug, although not established in California, is rated "B" because it has been entering California for many years on banana bunches from South America. It also occurs in Florida and it is occasionally encountered in quarantine from there. It was recently discovered on *Ficus benjamina* plants at a nursery in Lodi, **San Joaquin** County. The collection was made by Art Moretto on March 3.

AGLAONEMA SCALE, *Aspidiotus excisus*, -(Q)- A series of collections of this scale have been made

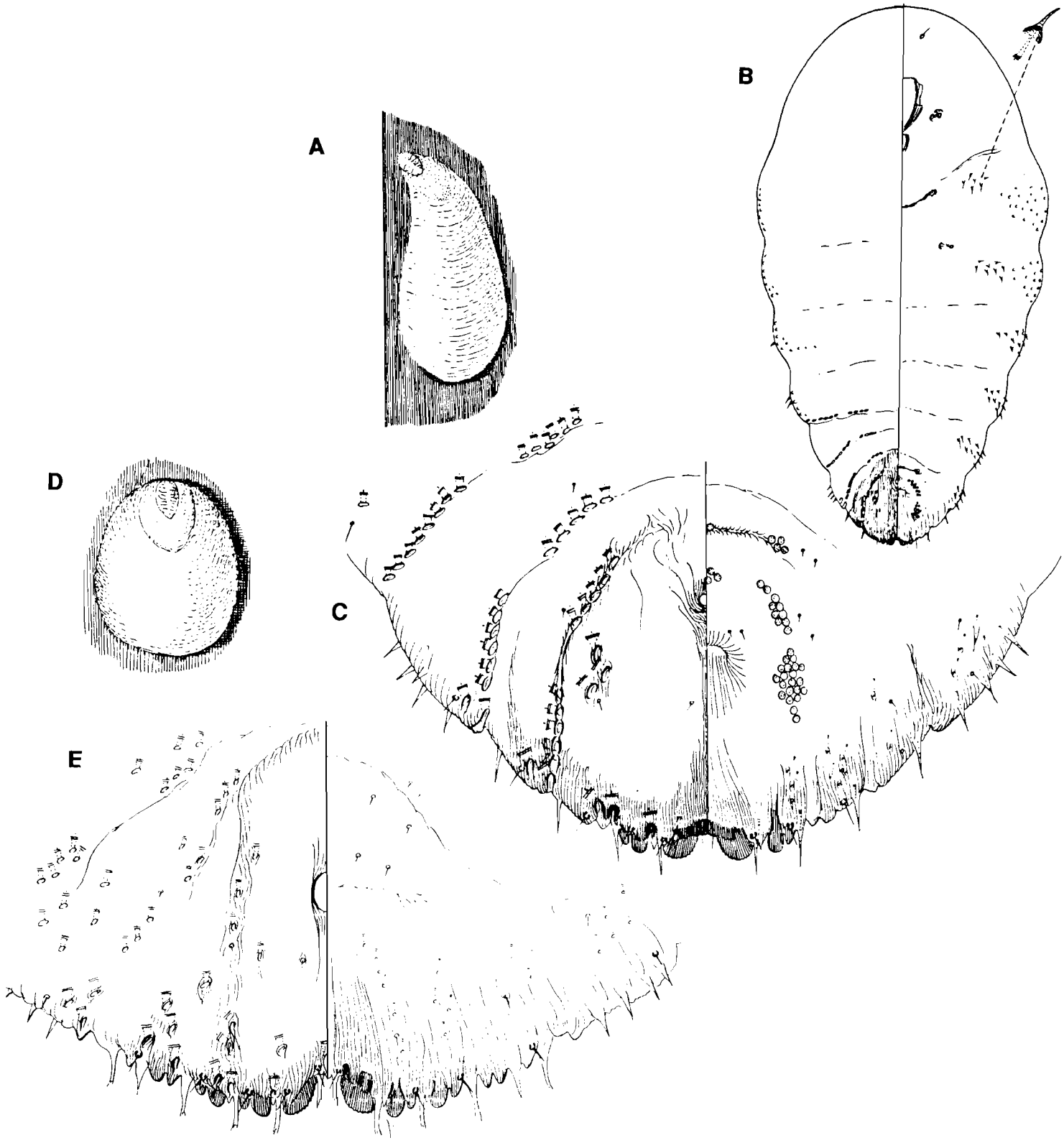


Fig. 5. Cycad poliaspis scale, *Poliaspis cycadis*. A. Habitus sketch of *P. cycadis* showing appearance of the scale cover of the adult female. B. Details of the morphology of *P. cycadis*, entire body. C. Details of the morphology of the abdominal pygidium of *P. cycadis*. D. Comparison sketch of cycad scale, *Furchadaspis zamiae*, showing appearance of the scale cover of the adult female. E. Comparison drawing of details of the morphology of the abdominal pygidium of cycad scale, *Furchadaspis zamiae*. Illustrations adapted from Ferris, 1937-47: Atlas of the Scale Insects of North America.

recently in **San Joaquin** County. The most recent discovery was made by Art Moretto in a nursery in Ripon on January 13 on *Aglaonema.*

MAGNOLIA WHITE SCALE, *Pseudaulacaspis cockerelli,* -(A)- This armored scale seems to be a perennial problem for California quarantine officers. It is frequently encountered on Florida, Texas and Hawaii nursery stock and plant materials and it is frequently found infesting California nursery stock, requiring eradicative measures. The first few months of 1993 have been no exception. Collections were made from the following locations during this period:

COUNTY	CITY	DATE	HOST	COLLECTOR
Sonoma	Penngrove	4/2/93	areca palm	Lino
(in quarantine at San Francisco)				
Orange	Anaheim	4/5/93	*Phoenix roebelenii*	Do
Orange	Costa Mesa	4/6/93	Chamaerops	Fernandez
Orange	Orange	4/19/93	*Strelitzia nicolai*	Do
Orange	Westminster	4/20/93	*Phoenix roebelenii*	Wynn/Kinsella
Orange	Westminster	4/20/93	*Strelitzia nicolai*	Wynn/Kinsella
Orange	Anaheim	4/20/93	*Strelitzia nicolai*	Wynn/Kinsella
Orange	Huntington Beach	4/21/93	*Phoenix roebelenii*	Wynn/Kinsella
Orange	Huntington Beach	4/21/93	*Strelitzia nicolai*	Wynn/Kinsella
Orange	Anaheim	4/21/93	*Phoenix roebelenii*	Wynn/Kinsella
Orange	Anaheim	4/21/93	*Strelitzia nicolai*	Wynn/Kinsella
Orange	Santa Ana	4/22/93	*Phoenix roebelenii*	Fernandez
Orange	San Juan Capistrano	4/22/93	*Phoenix roebelenii*	Bennett
Los Angeles	Pico Rivera	4/26/93	Phoenix	Papilli
Orange	San Juan Capistrano	4/27/93	*Phoenix roebelenii*	Bennett
Orange	Yorba Linda	4/27/93	*Phoenix roebelenii*	Wynn

Infestations of "A" and "Q" rated pests are encountered steadily on plant materials entering the state. Following is a partial list of some of the less common forms that were intercepted by county quarantine officers during the first four months of 1993:

GENUS - SPECIES	COMMON NAME	DATE	ORIGIN	HOST	COLLECTOR
Elaphria nucicolora	a noctuid moth	12/31	Haw.	Cut flowers	Limon
Teleonemia sp.	lacebug	1/4	Haw.	Herbs	Herrera
Sybra alternans	longhorn beetle	1/13	Haw.	*Ocimum* sp.	Herrera
Vinsonia stellifera	stellate scale	1/13	Co. Ric.	Schefflera	Williamson
Cecidophyopsis sp.	eriophyid mite	1/26	Ore.	*Ribes* sp.	Xerogeanes
Coccus capparidis	capparis scale	1/28	Haw.	Schefflera	Reed
Sybra alternans	longhorn beetle	1/28	Haw.	*Ocimum* sp.	Maraban
Acutaspis albopicta	albopicta scale	2/19	Tex.	Palm	Rawald
Spodoptera latifascia	an armyworm	3/8	Fla.	Saintpaulia	Reed
Cecilioides sp.	a snail	3/9	Fla.	Palm	Papilli
Opeas sp.	a snail	3/9	Fla.	Palm	Papilli
Sybra alternans	longhorn beetle	3/18	Haw.	Cut flowers	Czarnecki
Acutaspis albopicta	albopicta scale	3/31	Co. Ric.	Aglaonema	Reed
Paleocallidium rufipenne	longhorned beetle	4/6	Eur.	Dunnage	Azhar

SIGNIFICANT FINDS IN OTHER STATES AND COUNTRIES

CITRUS LEAF MINER, *Phyllocnistus citrella* -This leaf-mining moth was recently discovered in several southern Florida counties including Dade, Broward, Lee, Collier, Charlotte, Orange and Palm Beach. As of mid-June, the miner had been collected in a total of 91 sites. This is a new Western Hemisphere record. The miner can be a serious pest of both young trees and older trees during growth flush periods. The infestation in Florida currently includes both commercial and dooryard plants. Florida Department of Agriculture and Consumer Affairs personnel are currently delimiting the infestation. All infested plant material is required to undergo treatment prior to movement outside the infested locations.

The illustrations in Fig. 6 detail the morphology and appearance of this new pest.

The following data is taken from the USDA publication "Insects not known to occur in the United States" 1958, Vol.#8; 35-36, and includes technical information about this new pest:

> Citrus plants are sometimes seriously hampered by attacks of *Phyllocnistus citrella* in citrus-growing areas of Asia, especially the young tender shoots and leaves of plantation plants and young nursery stock. Injury is caused by larval mining which results in the killing of large amounts of tissue. When the mines become excessive in number, growth of the plant stops, though an infestation seldom causes the death of the tree. The mines have been reported as points of citrus canker infection in some areas where the disease occurs.
>
> The miner occurs throughout tropical Asia; being recorded from Iran, India, Sri Lanka, East and West Pakistan, Burma, Thailand, Malaya, Indonesia, Indochina, China, Korea, Japan, Formosa, Netherlands, New Guinea, Philippines, Loochoo Islands, Mariana Islands, and the Carolina Islands.
>
> The eggs are laid singly, two or three per leaf, on either surface, but usually on the underside near the midrib. During the summer, hatching takes place in about three days. The young larvae enter the leaf tissue and feed as miners without coming to the leaf surface during their five to six day development period. Typical injury consists of irregularly twisted galleries containing a brownish excrement. The epidermis over the galleries appears as a silvery film. Most of the mines are found on the upper surfaces of the leaves in the more humid and tropical areas. When larval feeding ceases, the epidermis of the leaf and opposing tissues are forced apart by the rolling and arching action of the larvae, thus forming a pupal chamber. That portion of the cocoon that is visible has a distinct orange cast. Emergence takes place in about six days, usually during the early morning hours. The adults are nocturnal and seldom seen. Populations are lowest from December to February and greatest from March to May and September to November in the Punjab of India. The species passes the winter solely as an adult. Approximately six generations are produced in Japan.
>
> The adults are very small, silvery-white with pale yellow markings, and a black spot at the tip of each forewing. Eggs are about 0.27 mm in length, flat, and without sculpturing or covering. The mature larva is cylindrical and dull yellow in color. The larval head is small. It has a pair of antennae terminating in two rounded lobes and rudimentary mouth parts with the exception of the spinnerets. The earlier larval stages are pale greenish-yellow and have

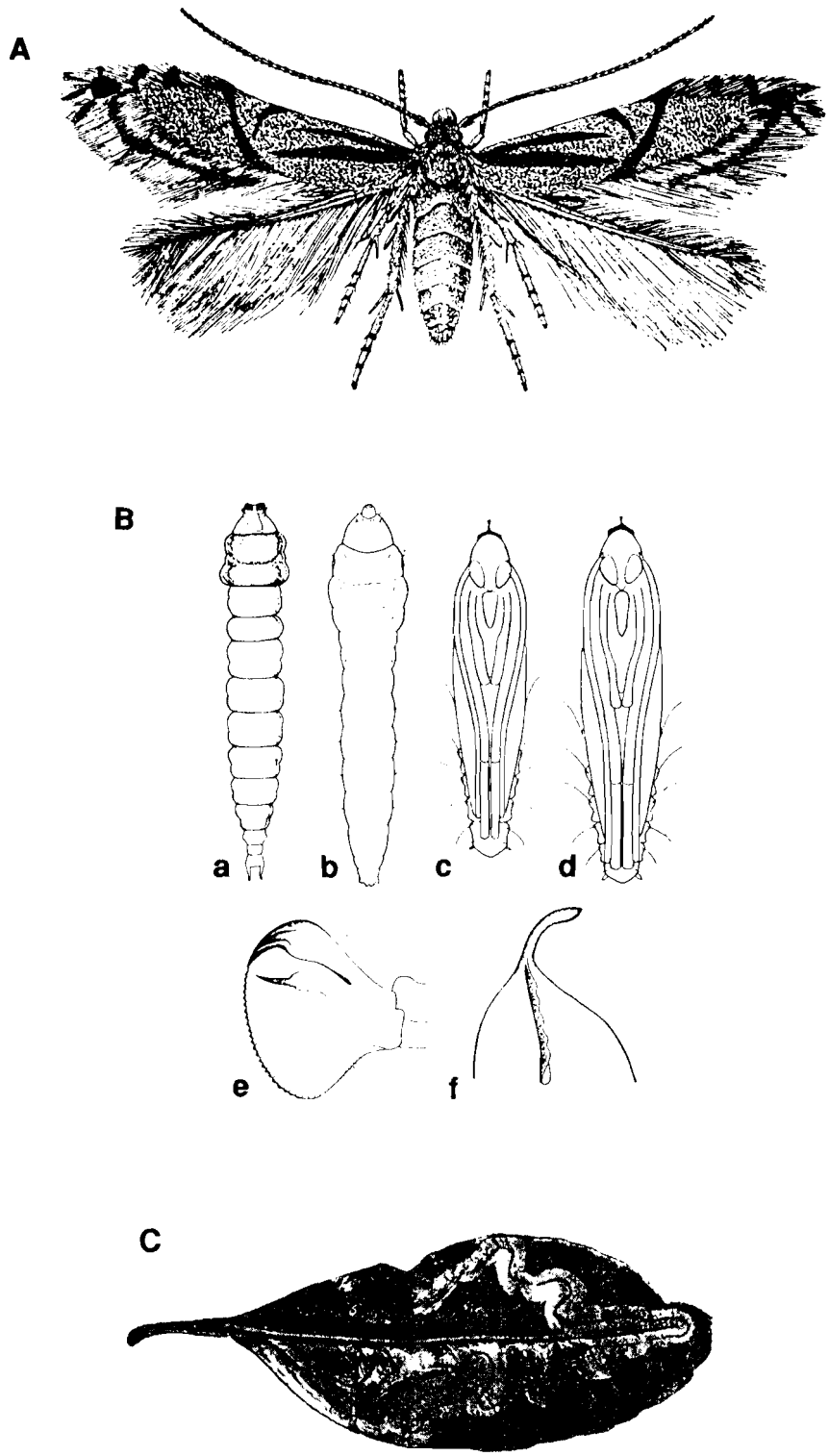


Fig. 6. Citrus leaf miner, *Phyllocnistis citrella.* A. adult. B. immatures, showing (a) mature larva, (b) prepupa, (c) male pupa, (d) pupa, (e) larval mandible, (f) pupal head prong. C. Damage to the citrus leaf by the mining larva. Illustrations taken from "Insects not known to occur in the United States," 1958.

modified mouthparts for sap feeding. The later larval stages are similar in form, though the head and thoracic segments of the earlier stages are proportionately larger. The pupa is pale yellow inside the cocoon, and has a stout curved prong on its head and heavy spines on the abdomen which are used during emergence.

In Florida, J. B. Heppner has produced several reviews on this pest (see references below) and has other works in press. The original collection was at **Homestead, Florida** on May 20, 1993. This infestation involved 90 percent of a 200 acre Persian lime orchard. Many other collections have come from nurseries, orchards and dooryards in the greater Miami area. In Florida at least, there are several native rutaceous species that could serve as alternate hosts for the miner, and it may also be able to attack several of the native mistletoes that occur there. The literature indicates that the miner often spreads very rapidly through areas when it is newly introduced. Indications are that it is doing the same in Florida.

References:

Heppner, J.B., 1993: Citrus leafminer, *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae: Phyllocnistinae). Fla. Dept. Agric. & Cons. Serv. Entomol. Circ. #359. 2 pp.

Heppner, J.B., 1993: Citrus leafminer (CLM), *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae: Phyllocnistinae). Florida State Collection of Arthropods, DPI/FDACS Summary Report: Pest Alert. 4 pp.

(Note: both references are available through Dr. Heppner at the Florida Department of Agriculture and Consumer Services, Division of Plant Industry, P.O. B. 147100, Gainesville, FL 32614-7100.)

APPLE PITH MOTH, *Blastodacna atra* - Another new lepidopterous pest has been discovered in the United States. Collections of the apple pith moth have been confirmed in Connecticut, New Hampshire, Massachusetts and Maine, with unconfirmed reports from Vermont and from New Hampshire as early as 1987. Further delimitation of the infestation is underway. The moth attacks young buds, particularly at blossom time. Its potential for causing serious damage is unknown at this time but is being evaluated. It is hoped that normal apple orchard pest control practices will control it commercially.

The adult pith moth wing spread measures 10 mm. The forewing is dark brown, suffused with white, with black plical and discal spots, and with occasional orange-brown basal and discal spots. The hindwing is grey. The head and thorax are white, mixed with dark brown; the abdomen is grey. The antenna is simple, filiform, nearly as long as the wings. The eggs are oval, blunt apically and finely reticulated. Eggs are translucent, pearly white, becoming purplish-brown with age. The larvae are brownish-pink with lighter color intersegmentally, a dark brown head and dark brown body plates. The larval body is clothed with many secondary setae. The pupa is yellowish-brown, with a darker head. The ninth abdominal segment has two ventral tube-like arms that project towards the head at an angle of about 45° with the surface of the body. These arms are flattened toward the tips, which bear numerous, small, hooked bristles. The illustrations in Fig. 7 detail the morphology and appearance of this new pest.

The known range of the pith moth includes nearly all of Europe and temperate Asia. It is considered a common and economic pest of orchards in continental Europe, and it is an occasional

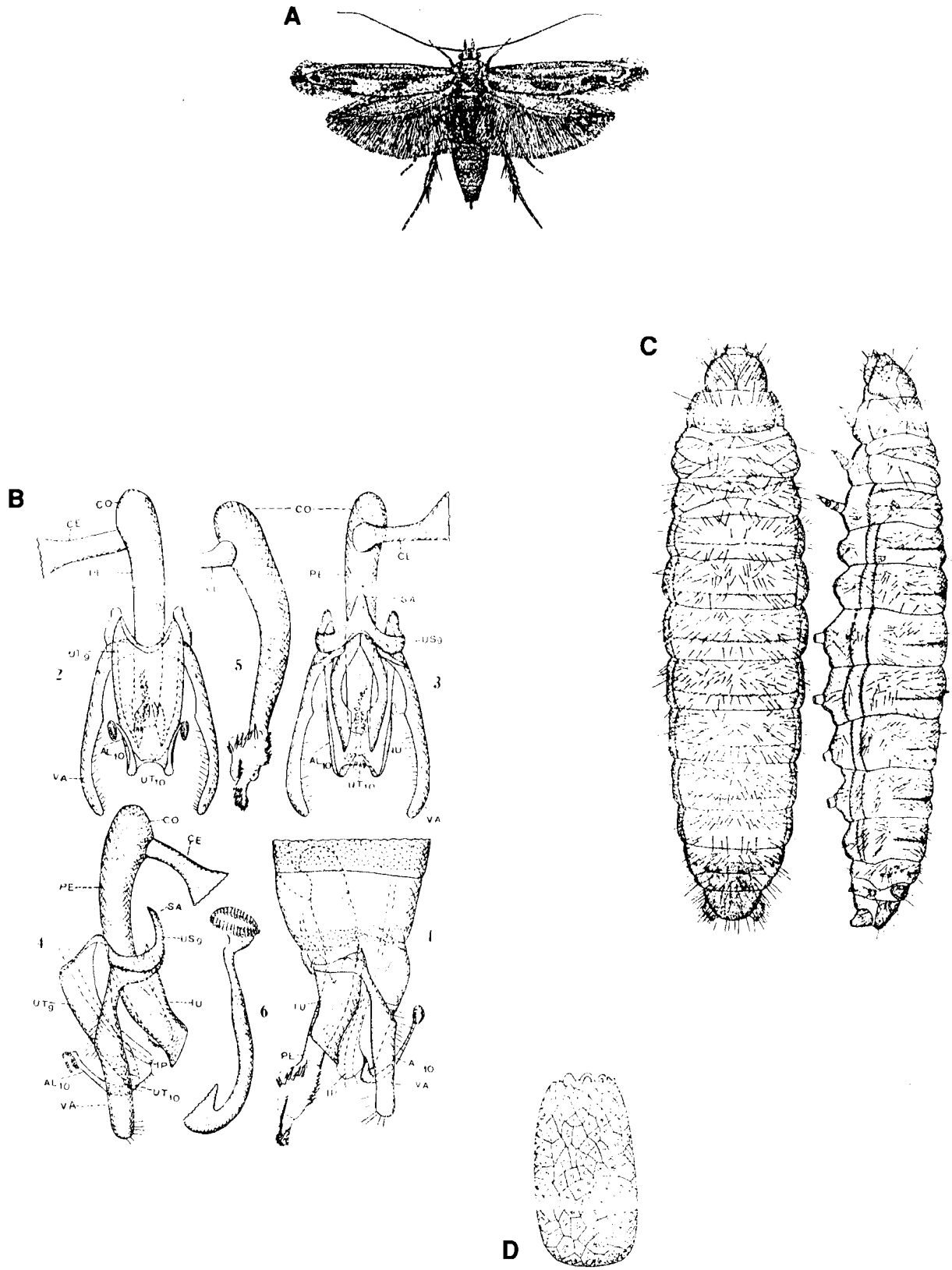


Fig. 7. The apple pith moth, *Blastodactus atras*. A. adult. B. adult genitalic structures. C. dorsal and lateral views of the mature larva. D. egg. Illustrations taken from Lucchese, 1942.

local problem in England. Larvae feed in flower and leaf buds, as well as developing shoots, causing die-back. Larvae are active between August and May. They bore into the stems and feed below the bark in the vicinity of a bud throughout the winter. When one bud is consumed, the larva moves to a fresh site and bores into the stem again.

From 60 to 80 eggs are laid in July and August. The eggs are laid close to the leaf axils and hatch in about two weeks. Pupation occurs in the stem in May and June.

References for apple pith moth:

Carter, David J., 1984: Pest Lepidoptera of Europe with Special Reference to the British Isles. Dr. W. Junk, Boston. 431 pp.

Lucchese, E., 1942: Contributi alla conoscenza dei lepidotteri del melo 5. *Blastodacna putripennella* Zell. Boll. R. Lab. Ent. agr. Portici 5: 175-195.

Massee, A.M., 1937: The Pests of Fruits and Hops. Crosby Lockwood & Son Ltd., London. 294 pp.

AFRICANIZED HONEY BEE (AHB), *Apis mellifera scutellata*, -(Q)- Traps are continuing to be installed along the Texas highways. As of February 28, APHIS was servicing some 750 traps while Texas A&M University Apiary Inspection Service had approximately 400 traps in service. Texas A&M placed Williamson County under quarantine on February 26 after identifying an AHB sample from the Round Rock area.

A presentation given by APHIS AHB trap inspectors from Del Rio, Texas was so well received that local businesses have united to provide funding to reprint the AHB Awareness Pamphlet developed by Texas A&M and Extension Service. The pamphlet will include information on how to prevent stinging incidents plus other general information about AHB. The pamphlet will be printed in both English and Spanish.

It appears that the swarming season this year has not been as heavy as last year. Fire Department and Health Department officials have stated that the number of calls they have received this spring is much lower than last year. AHB interest has increased in New Mexico and Arizona as well. New Mexico now has 120 traps in the field. Arizona has 270 traps along the Mexican border from Nogales to Douglas and in the Yuma area.

As of May 24, the number of bee samples identified increased noticeably, especially in Mexico. Two swarms of honey bees were found the week of May 3 in the border town of Mexicali, just south of El Centro, California. The swarms, one identified as AHB and the other EHB, were destroyed after being sent to Mexico City for identification. Both swarms were found in spools of electrical wire that were transported to Mexicali by truck from a ship arriving in Vera Cruz, Mexico from Brazil.

According to Bill Routhier, area manager of the California Department of Food and Agriculture's Pest Detection and Emergency Projects Branch, "These swarms do not represent the migratory front of the Africanized honey bee... But hitchhiker swarms like this serve as a warning to local agencies and the media." The migratory front is now predicted to possibly reach Arizona this year and California next spring or summer.

Extensive efforts are underway in Southern California to educate the public, particularly students, on how to learn to live with the Africanized bee. Seminars have been held for emergency response people and lesson plans are being developed for teachers and for workers likely to be exposed to AHB.

Honey bees are vital to U. S. agriculture, pollinating $20 billion worth of crops each year. Many of the fruits and vegetables grown in California require bee pollination.

BORDER STATIONS

The California border station concept was developed many years ago; and agriculture and related industries have benefited greatly by the exclusion of exotic pests. However, the state of Arizona has also used the border station system, from which California has benefited. Due to funding problems last year, however, Arizona's border stations were closed. Now we have word that some of the Arizona stations will be reopened. The following report by Bill Sandige of CDFA outlines this reopening:

> We have been advised that after a one-year closure, The Arizona Department of Agriculture will reopen four of its border agricultural inspection stations on or very soon after July 1, 1993. The stations that will be reactivated on the eastern border are Sanders (Interstate 10) and San Simon (Interstate 40) and on the western border stations will be Ehrenberg (Interstate 10) and Yuma (Interstate 8).
>
> Arizona inspectors will concentrate their efforts on commercial truck inspections, as well as conducting inspections on recreational vehicles and boats during the gypsy moth season. Minimal staffing will be maintained to provide these inspections and all existing interior inspection offices will remain open to perform terminal, native plant and nursery inspections.
>
> The reopening of Arizona's border agricultural stations is significant to California because it will provide an additional pest-free buffer zone between our state and the eastern states which have many plant pests that do not occur in California.

Border Station inspectors encounter many common and sometimes serious pests in their daily routines. Gypsy moth and red imported fire ant are some examples such as the find of a colony of the fire ant including a queen that was made by Michelle Van Horn at the Winterhaven inspection station on March 21. But occasionally they encounter some uncommon or otherwise very unusual and sometimes significant pests. The following examples will illustrate this point:

> Dead fruit fly larvae (*Anastrepha* sp.) were collected from **commercial mangos** at the Blythe inspection station by Glenn Moline on February 27. The significance of this find is that the mangos came from Peru. This is the first time an interception was made at a border station from this part of the world.
>
> Live banana thrips, *Frankliniella parvula*, were found on a commercial shipment of banana blossoms from Mexico. The blossoms were to be used in the floral trade. The thrips is common in South and Central America and the Caribbbean. It is not know to occur in the United States and this is the first time that it has been intercepted at California's border.

Some immature psyllids were collected by Steve Klingenmeier at the Blythe inspection station from an automobile arriving from Mexico. The psyllids were on recently collected leaves from an unknown plant which reportedly had medicinal properties. The psyllids were in the nymphal stage, which prevented an accurate and specific identification. But the reason the collection was significant was that the psyllids were lerp-formers. The word lerp is a term that describes an ornate fishscale-like protective covering produced by some psyllids in the nymphal stages. Also of interest is the fact that almost all of the known lerp forming psyllids occur in Australia. We presently do not have records of native Mexican lerp forming psyllids.

Among the more common pest species that California is concerned about, the sweet potato weevil collection by Steve Klingenmeier at the Blythe inspection station on March 2 is of special interest considering the recent detection of this weevil in the sweetpotato growing areas of Central California. See the story on this new California record under the "NEW STATE RECORDS" section. Steve collected the live weevil which was wandering around in a U-haul trailer from Texas. Back in December, Mike Ebers collected this weevil species at the Winterhaven station from Mississippi sweetpotatoes carried in a Florida recreational vehicle.

Some common pests collected at the border stations tend to be very seasonal in nature. An example is the arrowhead scale (*Unaspis yannonensis*), a pest of citrus in Asia. Many of the mandarins and Unshu oranges grown in Japan and Taiwan are shipped as exports to British Columbia during the winter months. Much of this fruit seems to end up in Canadian vehicles entering California, particularly at the northern borders. The following is an example of some of this winter season's collections of arrowhead scale:

Station	Date	Destination	Collector
Hornbrook	12/07	Blythe	Whitman
Hornbrook	12/11	Chico	Gamlin
Dorris	12/12	Sacramento	Garrison
Dorris	12/12	Lodi	Leslie
Hornbrook	12/13	San Francisco	Whitman
Dorris	12/14	Los Angeles	Leslie
Hornbrook	12/17	Los Angeles	Anderson
Dorris	12/19	Fresno	Leslie
Hornbrook	12/20	Los Angeles	Silva
Yermo	12/20	San Clemente	Blakely
Hornbrook	12/21	San Jose	Leslie
Hornbrook	12/24	Redding	Whitman
Hornbrook	01/10	Winterhaven	Gamlin
Hornbrook	02/13	Palm Springs	Whitman
Hornbrook	03/11	Los Angeles	Whitman

PLANT PATHOLOGY HIGHLIGHTS

SIGNIFICANT FINDS AND NEW STATE RECORDS

CHRYSANTHEMUM WHITE RUST, *Puccinia horiana*, -(A)- During a survey around an infected nursery in Soquel, **Santa Cruz** County, chrysanthemum white rust (CWR) was detected at 17 residences marking the first significant detections of CWR at residences since the eradication program began in December 1991. All the plants were destroyed.

FUSARIUM WILT, *Fusarium oxysporum*-- Fusarium wilt of basil was first reported in the United States in Massachusetts in 1990. In 1992, severe losses were detected in California basil fields in the counties of **Stanislaus** and **San Joaquin**. Symptoms of the disease caused by *Fusarium oxysporum* infection include wilting, partial to total defoliation, stem necrosis, extensive vascular discoloration above and below the ground, and death. R. M. Davis and K. D. Marshall, Department of Plant Pathology, U. C. Davis, and J. Valencia, Cooperative Extension are credited with the California discovery. These university representatives have consistently recovered the pathogen from stems of affected plants. The disease has not yet been identified by CDFA pathologists.

CITRUS POSTHARVEST DISEASE, *Penicillium ulaiense*-- This pathogen of citrus has gone unrecognized in California for many years. Sometimes mistaken for *P. italicum* because of environmental variations, interest arose when it was found to be relatively insensitive to imazalil, thiabendazole, and *o*-phenylphenol, the three principal fungicides used in California citrus packinghouses where this fungus has been isolated with great frequency.

Although thirty isolates were collected in April and May 1992 from grapefruit (*Citrus X paradisi* Macfady), orange (*C. sinensis* (L.) Osbeck), and lemon (*C. limon* (L.) N. L. Burm.) at eight different packinghouses in southern California, *P. ulaiense* has not been collected in citrus grooves. Because isolates of this fungus collected in California are resistent to postharvest citrus fungicides, selection pressure may be responsible for their detection in packinghouses only. Credited with the discovery of this new postharvest disease caused by *P. ulaiense* are G. J. Holmes and J. W. Eckert, Department of Plant Pathology, U. C. Riverside, and J. I. Pitt, CSIRO Food Research Laboratory.

SIGNIFICANT FINDS IN OTHER STATES AND COUNTRIES

POTATO VIRUS "Y", NECROTIC STRAIN (PVY-N)-- On March 17, APHIS was contacted by the Florida Department of Agriculture and Consumer Services concerning the confirmation of the presence of PVY-N in a 26-acre commercial potato field growing Atlantic variety potatoes for processing on a 678-acre farm in Manatee County, Florida. The ELISA testing that resulted in this detection was done as part of a statewide PVY-N survey. Confirmation of the presence of PVY-N was based on a bioassay involving the inoculation of B-21 tobacco.

Emergency quarantine actions have been taken to preclude the possibility of spread. Since the farm is at least eight miles from any other potato farm, there appears to be minimal risk of virus

spread by aphids. The PVY-N infestations were found in potatoes from seed produced by two New Brunswick, Canada, growers. APHIS is working with Ag Canada to determine if other shipments of seed potatoes were imported from these growers. It has been determined that during the period November 1992 through March 1993, as many as 311 shipments of seed potatoes that APHIS believes were infected with the necrotic strain of PVY-N were shipped from New Brunswick, Canada, to 16 states before Canadian officials discovered the problem.

APHIS is requiring that those seed potatoes still in storage not be planted. Disposal options have been furnished to the states. It would not be cost effective to deal with potatoes already planted, so fields will be monitored for disease symptoms.

SPECIAL REPORT

Occasionally common pest problems become more of a problem than normal because of some environmental upset. The following diseases have been very noticeable early this year because of the large amounts of very welcome precipitation that California received during the winter and spring months. The following report discusses the diseases and the problems that have developed:

Olive Knot and Oleander Gall

by Dan Opgenorth, CDFA Plant Pathologist

After seven years of drought, California has finally had a wet and stormy spring. As a result, an increase of plant diseases caused by bacterial pathogens has been observed. This is because pathogenic bacteria survive well outside of their host where there is a film of moisture to protect them. The windy and stormy conditions normally associated with spring provide the vehicle to spread bacteria and cause the wound injuries, which serve as the portals of entry to susceptible plant tissue.

Two diseases that recently gained attention are olive knot and oleander gall. These diseases have many similarities and are now believed to be caused by the same bacterial agent. Olive knot was first described by the ancient civilizations which cultivated olives in the area around the Mediterranean sea. When the Spanish originally brought olives to California, they were grown from seed and were believed to be free of disease. However, in the later part of the nineteenth century, wood of numerous varieties was imported from Europe and soon after olive knot was reported in California. About the same time the ornamental oleander also arrived. One of the first reports of oleander bacteriosis in California was by Smith (1928), who associated the cool and wet spring of 1926 with an especially severe outbreak around the Riverside area. A considerable amount of work was later done by Smith in comparing oleander gall and olive knot. The similarity of these diseases was recognized, as well as differences from crown gall incited by *Agrobacterium* species.

The bacterium causing olive knot and oleander gall is now believed to be *Pseudomonas savastanoi* or various strains which may exhibit some degree of preference for either host. This pathogen is

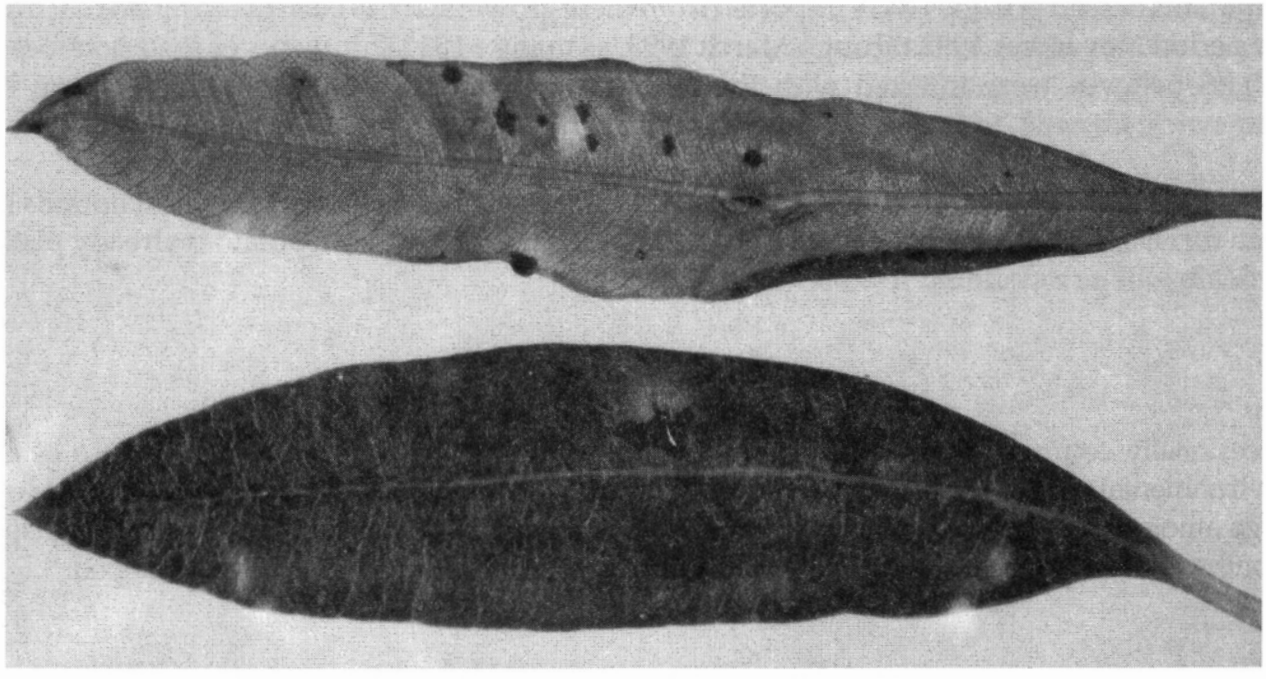


Fig. 8. Oleander gall, on leaves of oleander, caused by *Pseudomonas savastanoi.*

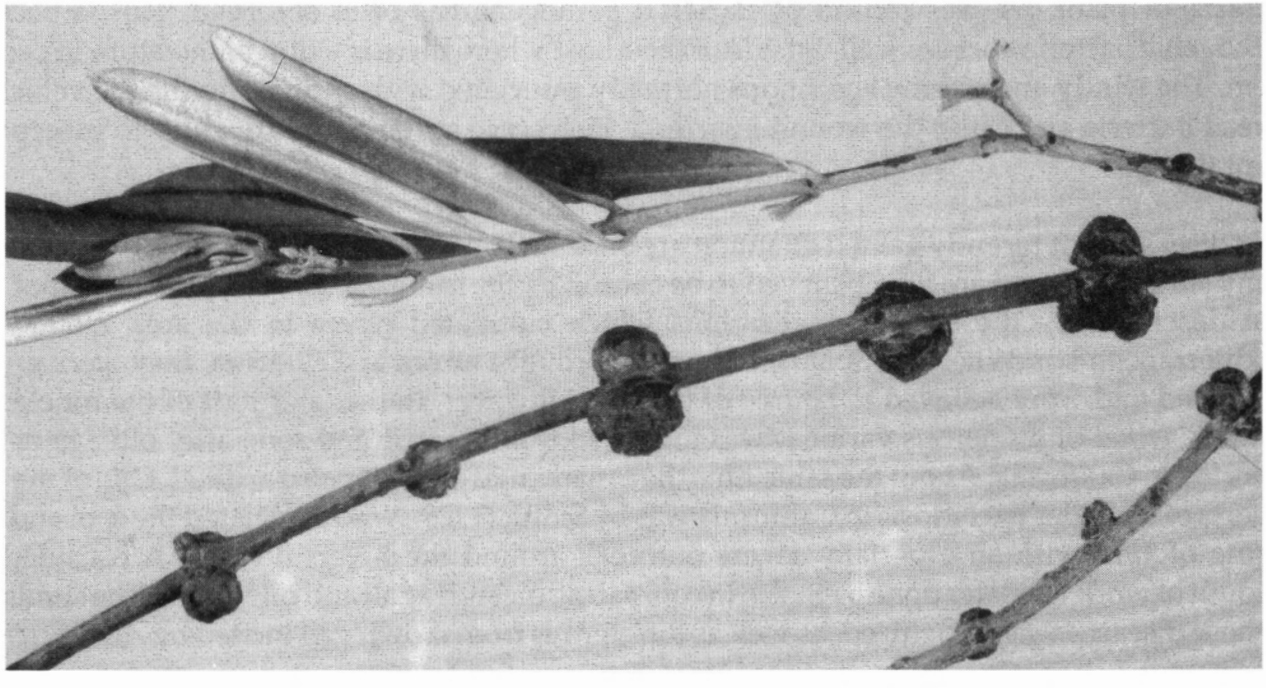


Fig. 9. Olive knot, on twigs of olive, caused by *Pseudomonas savastanoi.*

a close relative of the more generic *Pseudomonas syringae* which causes bacterial canker and blast on fruit trees. These *Pseudomonas* spp. are gram negative motile rods; colonies appear white with smooth or wavy margins; they are oxidase and arginine dihydrolase negative; and more or less fluorescent on medium B of King et al. Some isolates from oleander were found to be weakly fluorescent. Extensive work has shown that bacteria isolated from each host are identical based on physiological, serological and pathological evidence.

The disease cycle usually starts in fall when the rains begin. Bacteria exuded from galls or knots are then spread by wind-blown rain and find a leaf abscision site, pruning wound, frost crack or other physical opening. An infection is initiated even though not immediately evident. At the cold temperatures of 5-10° C the bacteria survive but grow very slowly. Later in spring, when the host begins to grow, a malformation composed of plant tissues with cells of abnormal size and number becomes evident. The bacteria can also be spread by insects, birds, and by pruning activities.

On the olive, galls usually enlarge and are present only at or close to the initial site of infection. Based on early work, Smith claimed that metastasis was involved with oleander gall; the bacterium could spread through the plant and galls appear at distant sites. Later work has shown that the bacteria can move in the xylem of both hosts but usually only short distances. Oleander, however, has many laticifers (latex ducts) which allowed greater movement of the bacteria through the plant. While the bacteria are contained in knots on the olive, the presence of the disease will impart an off-flavor to all the fruit on the tree.

The best means of control of the disease is avoidance through the purchase of clean nursery stock. When galls or knots are evident, they can be removed by pruning to decrease the amount of bacterial inoculum in the area. Protective sprays during the cool wet season and especially in spring can reduce the spread of this pathogen considerably.

References:

McCain, A.H. and M.N. Schroth, 1979: Olive knot. Univ. of Calif. Extension Service Leaflet 21091.

Schroth M.N., D.C. Hildebrandt and H.J. O'Reilly, 1968: Off-flavor of olives from trees with olive knot tumors . Phytopathology 58:524-525.

Smith, C., 1928: Oleander bacteriosis in California. Phytopathology 18:503-520.

Wilson, E.E. and A.K. Magie, 1963: Physiological, Serological, and Pathological Evidence That *Pseudomonas tonelliana* is identical with *Pseudomonas savastanoi*. Phytopathology 53:653- 659.

Wilson, E.E. and A.K. Magie, 1964: Systemic invasion of the host plant by the tumor-inducing bacterium, *Pseudomonas savastanoi*. Phytopathology 54:576-579.

Wilson, E.E. and J.E. Ogawa, 1979: Bacterial Diseases of Olives; Olive Knot; Pages 166-169, in: Fungal, Bacterial and Certain Nonparasitic Diseases of Fruit and Nut Crops in California. Division of Agricultural Sciences, Univ. of Calif.

BOTANY HIGHLIGHTS

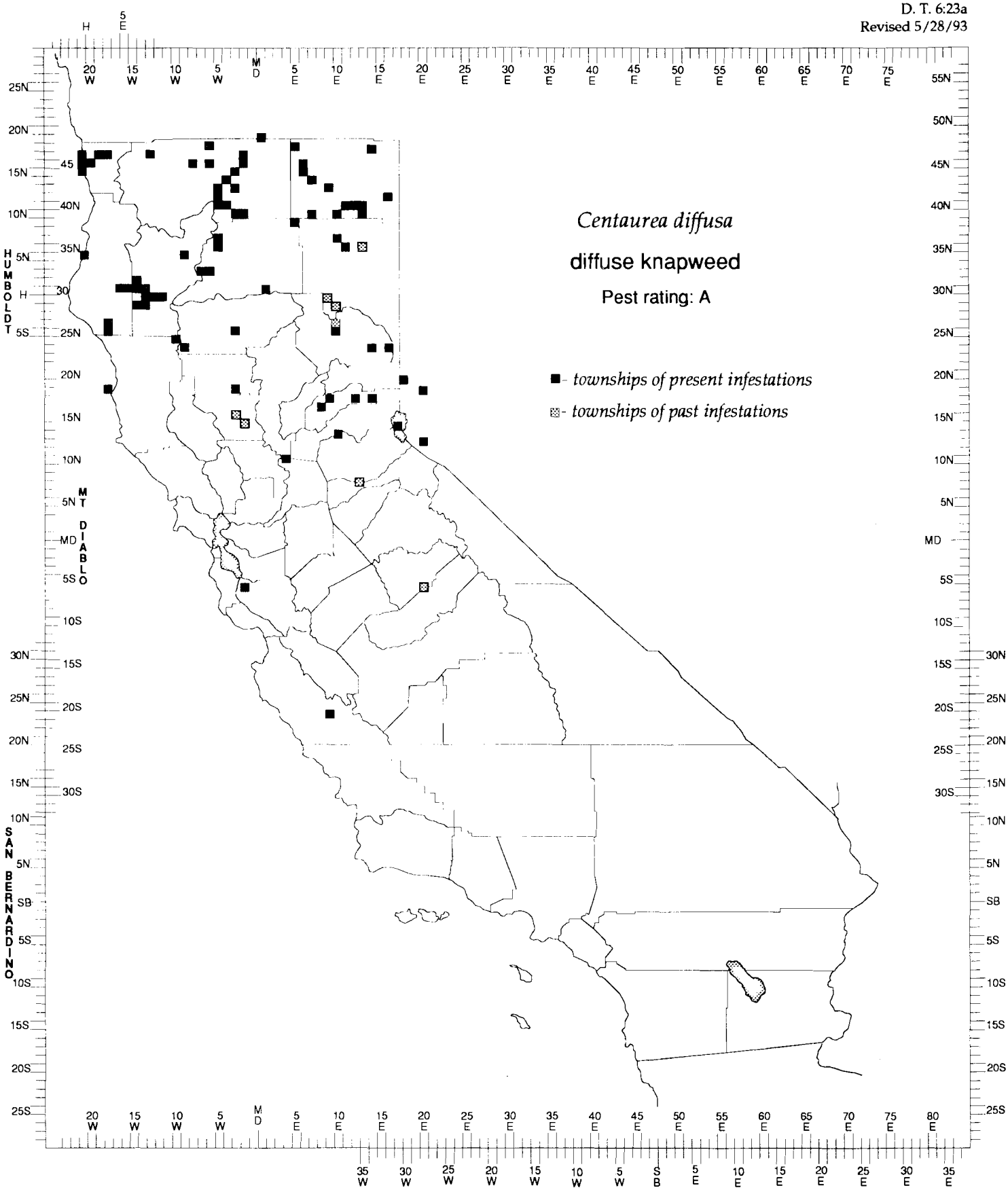
On the following pages are updated California weed maps with corrections and revisions, courtesy of CDFA Botanist Doug Barbe. Two issues of the CPPDR, Volumes 9, (1-2) and (3-4), 1990 contained a complete map set for all of the noxious weeds known in California. The distribution of these weed pests is continually being updated by Doug from both new field collections and from old herbarium records found in botanical institutions around the state.

STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

26

DETECTION MANUAL
D. T. 6:23a
Revised 5/28/93

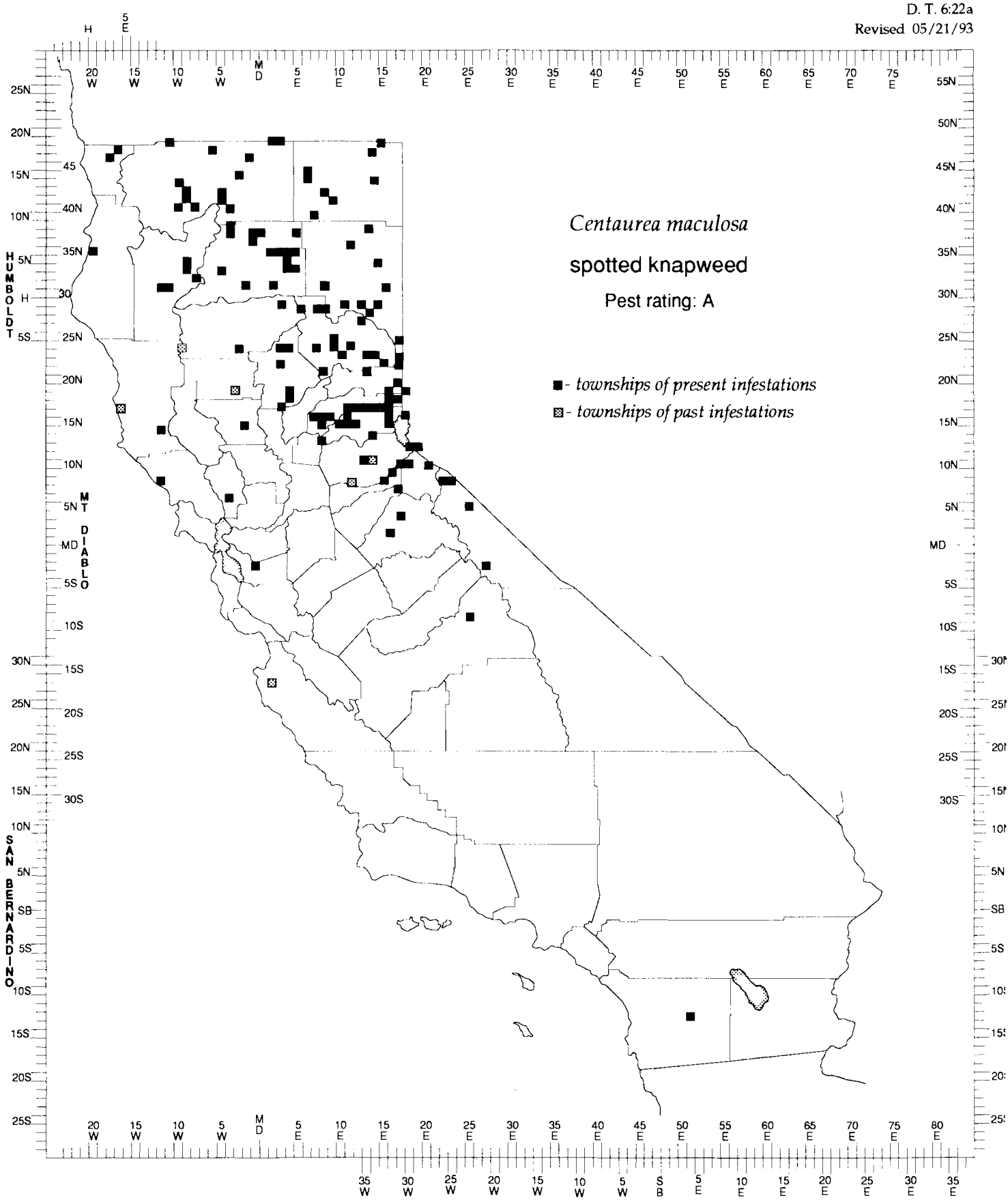


STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

27

DETECTION MANUAL
D. T. 6:22a
Revised 05/21/93

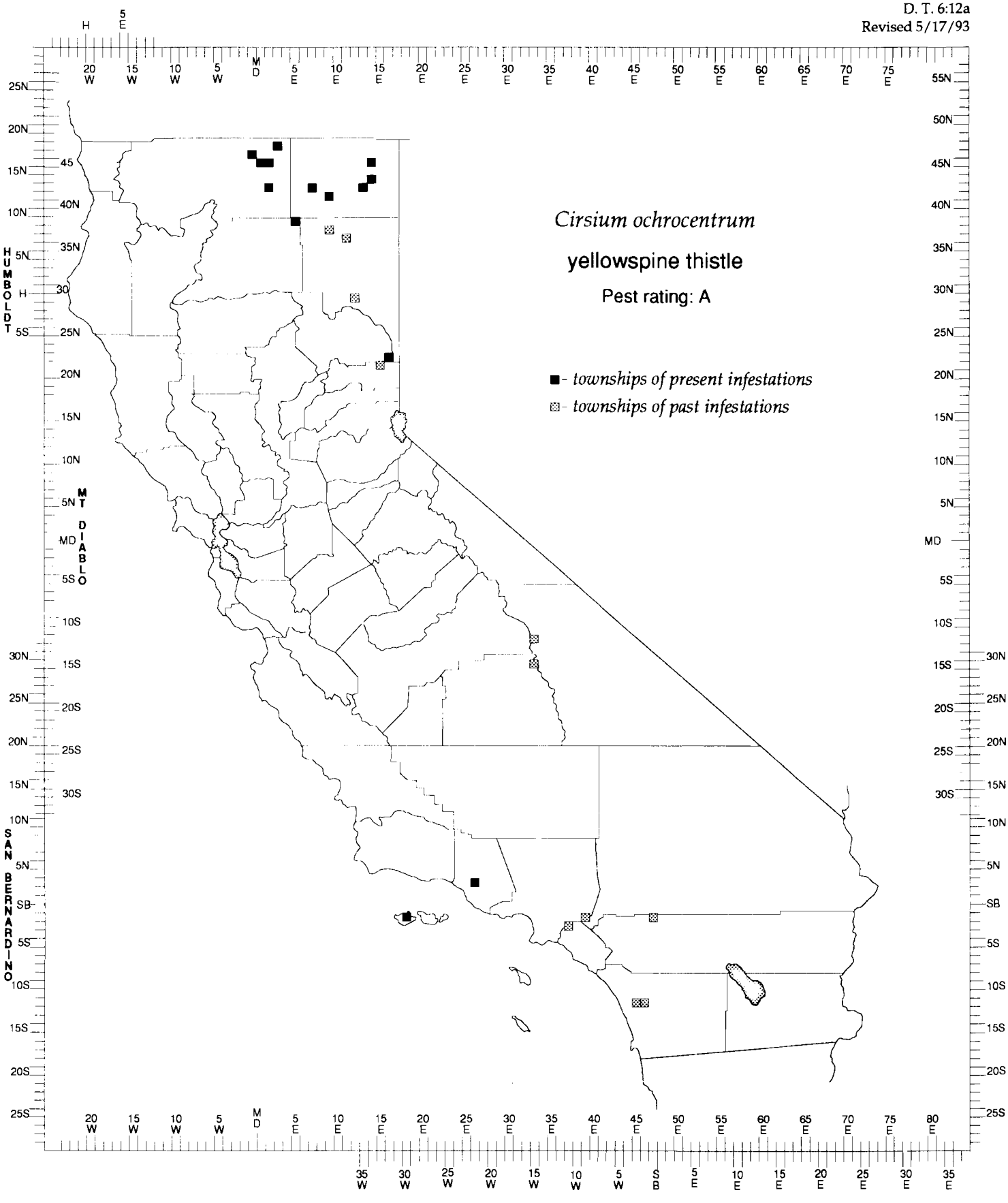


STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

28

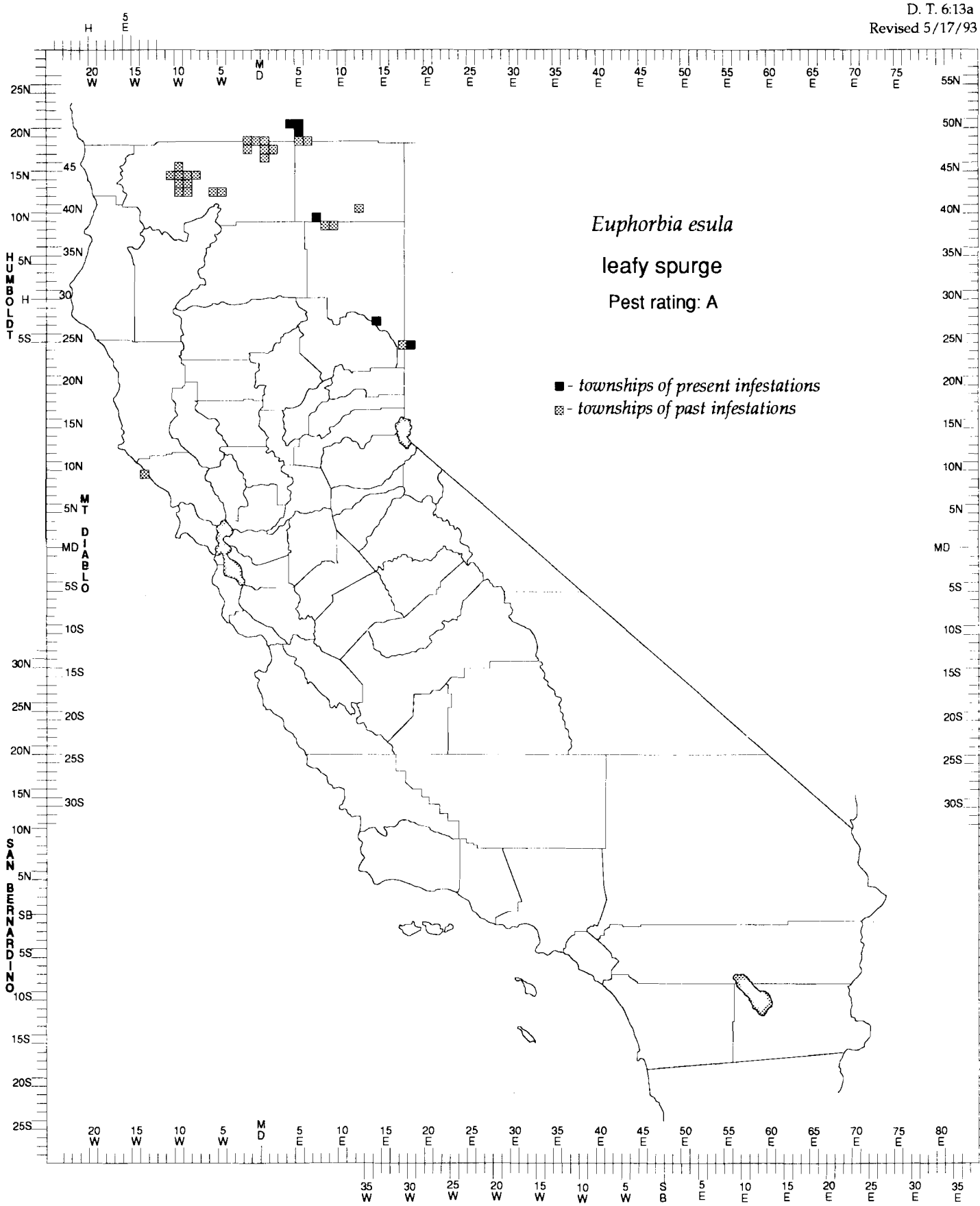
DETECTION MANUAL
D. T. 6:12a
Revised 5/17/93



STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

DETECTION MANUAL
D. T. 6:13a
Revised 5/17/93

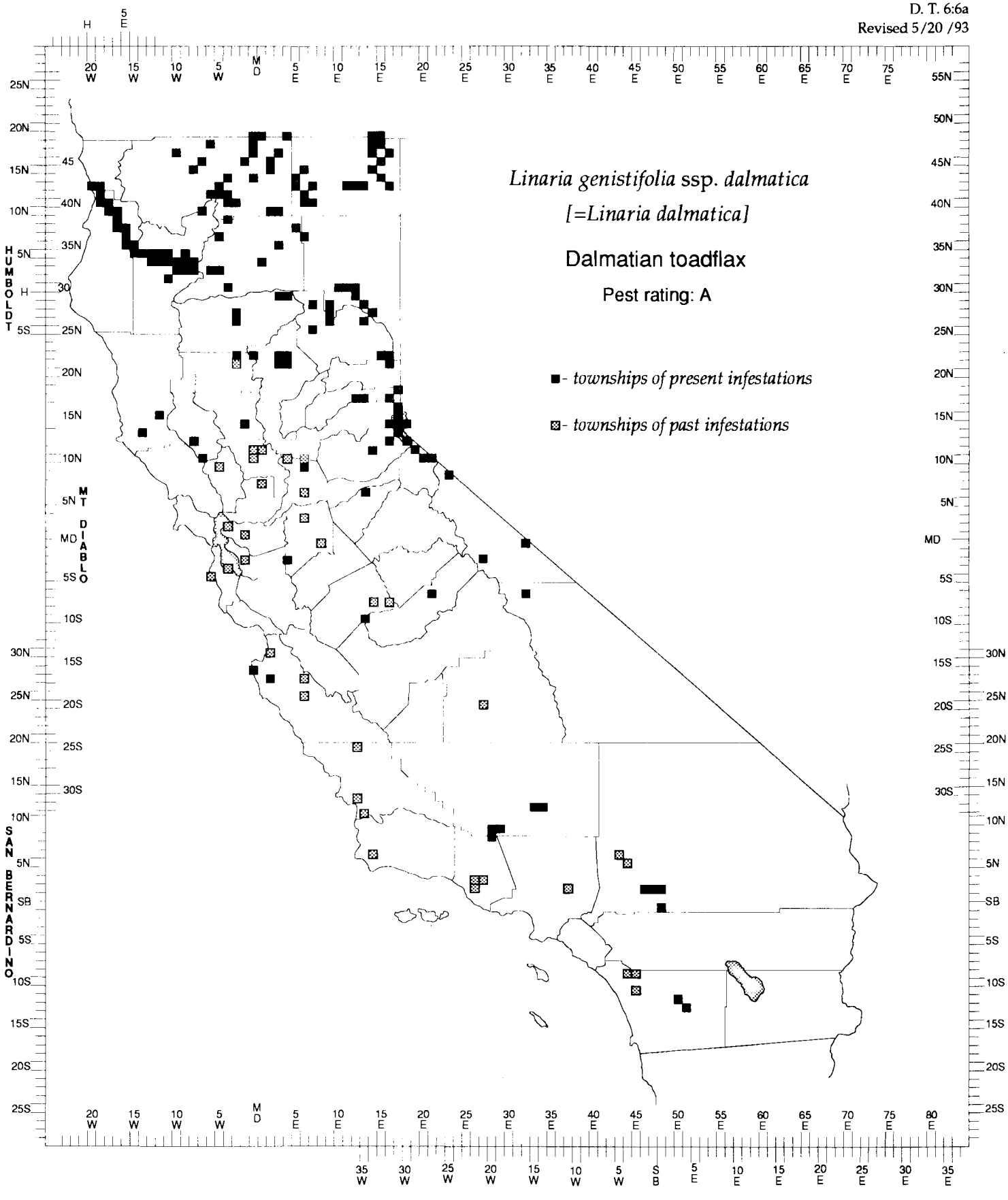


STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

30

DETECTION MANUAL
D. T. 6:6a
Revised 5/20 /93

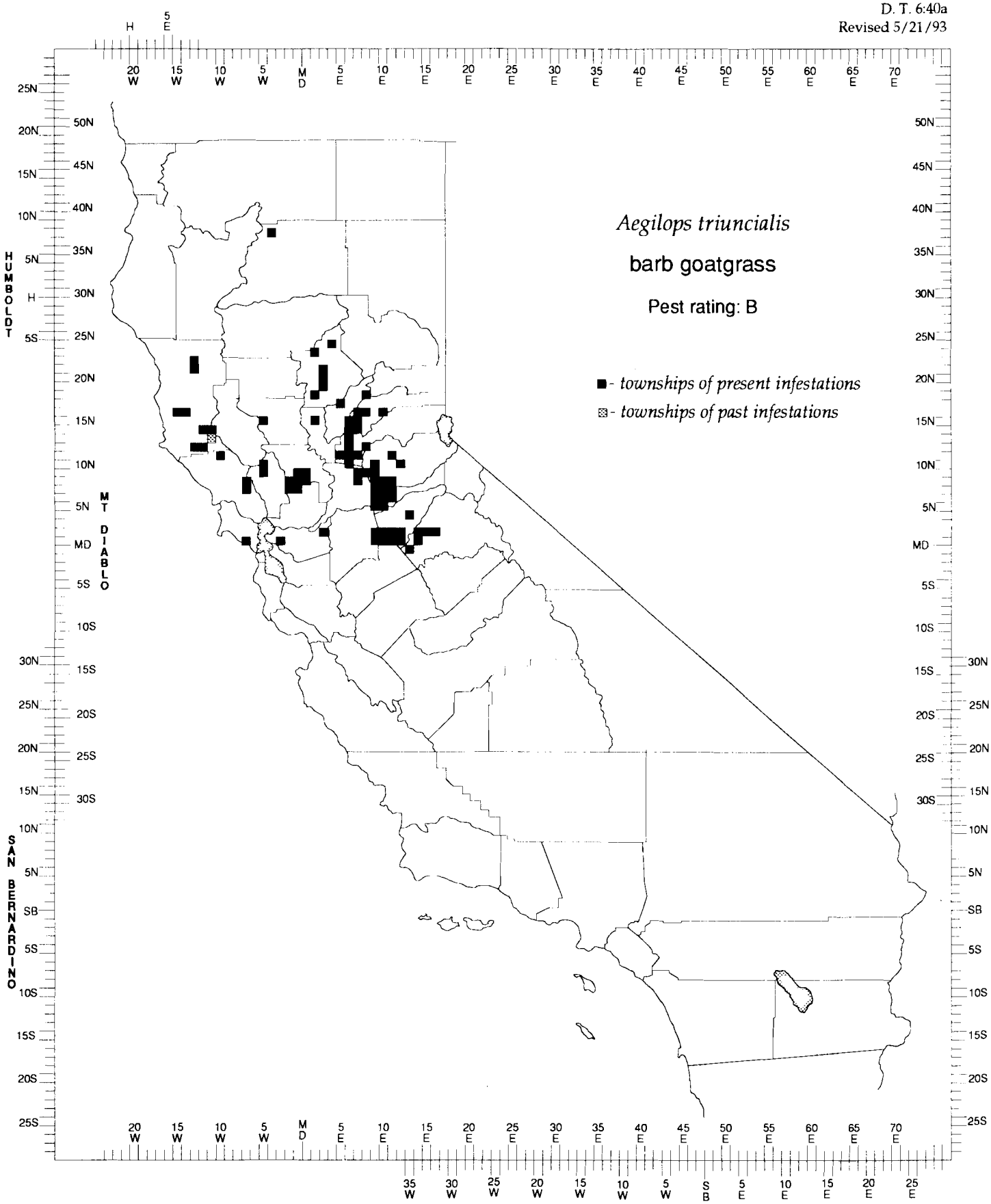


STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

31

DETECTION MANUAL
D. T. 6:40a
Revised 5/21/93

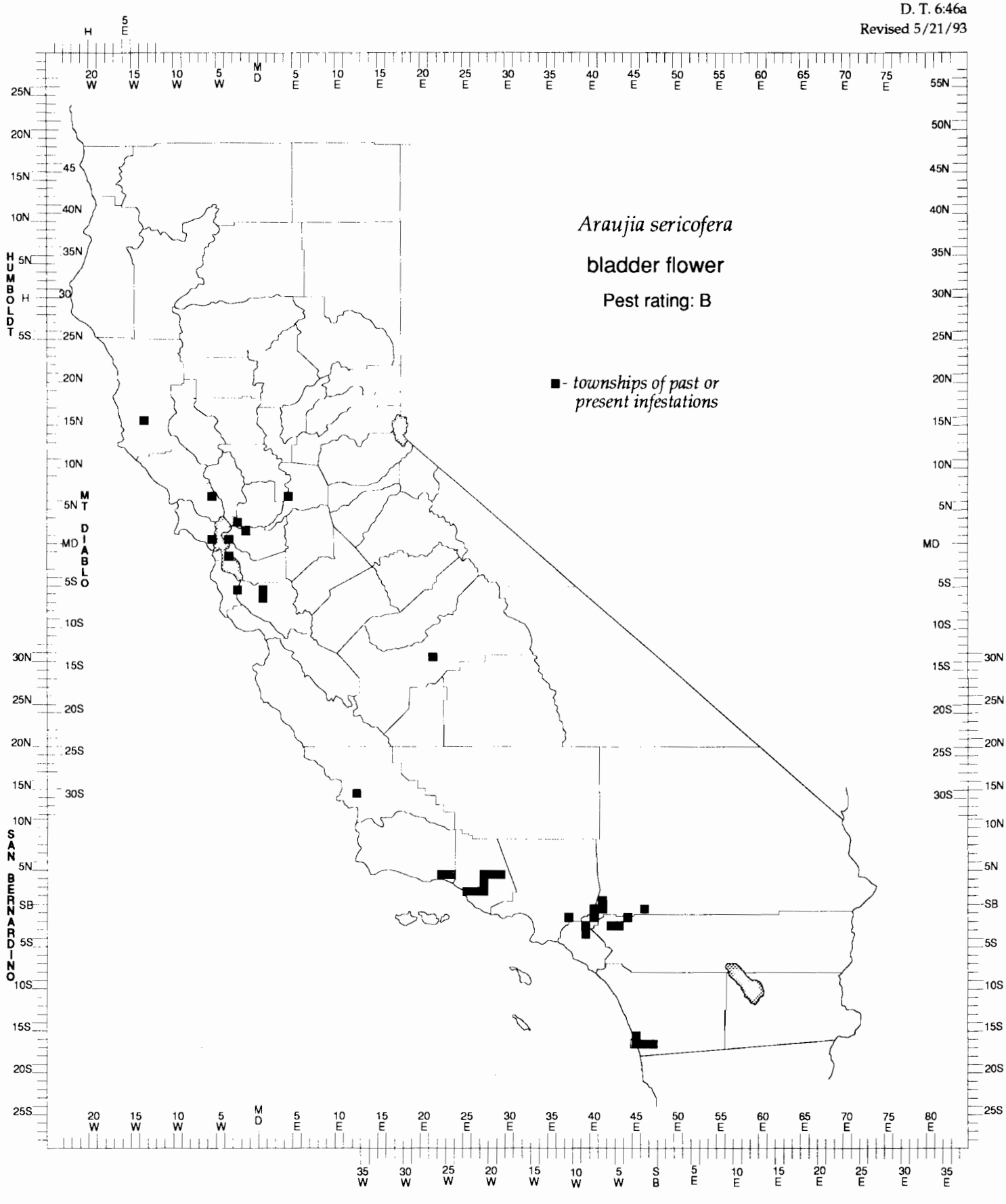


STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

32

DETECTION MANUAL
D. T. 6:46a
Revised 5/21/93

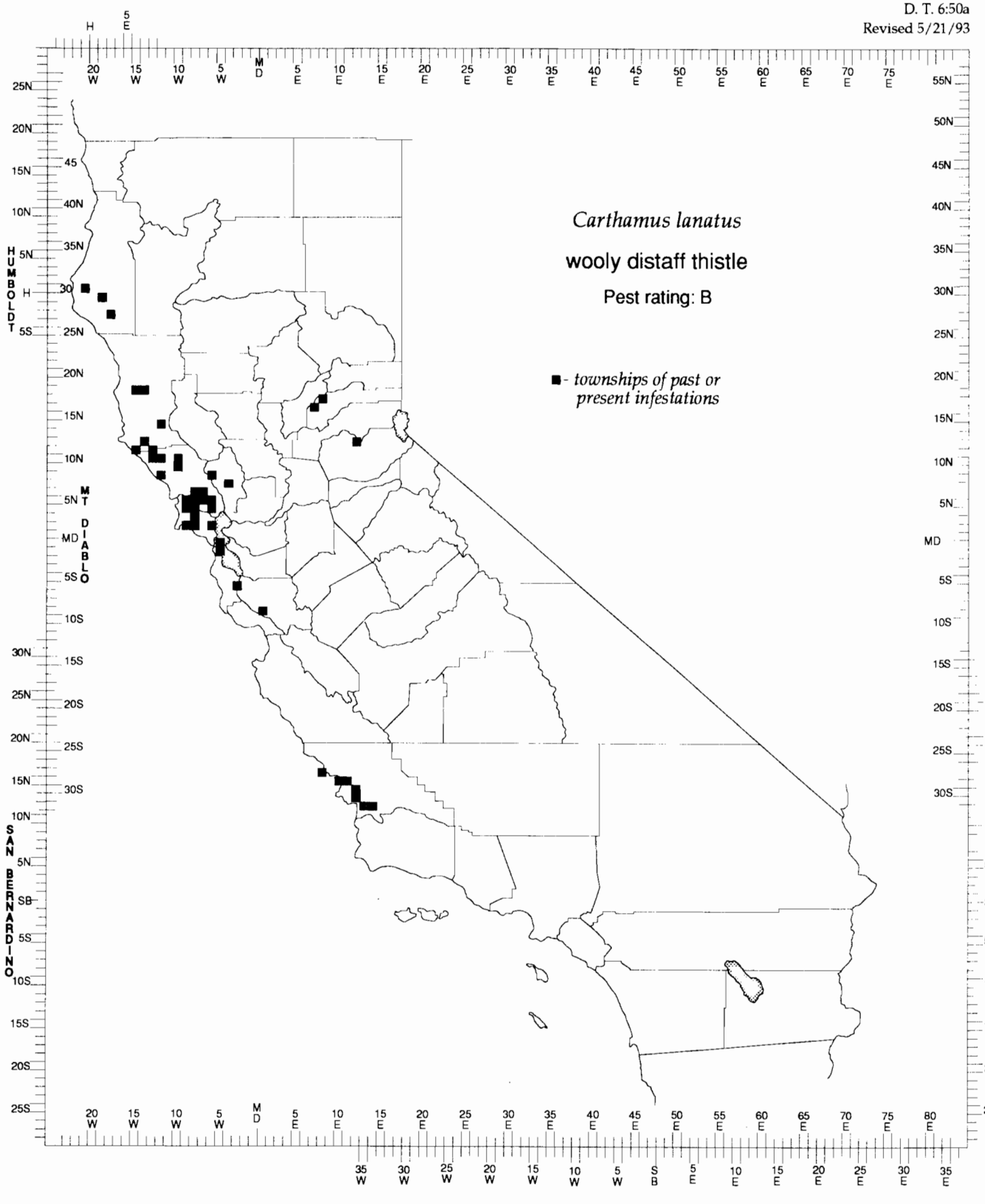


STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

33

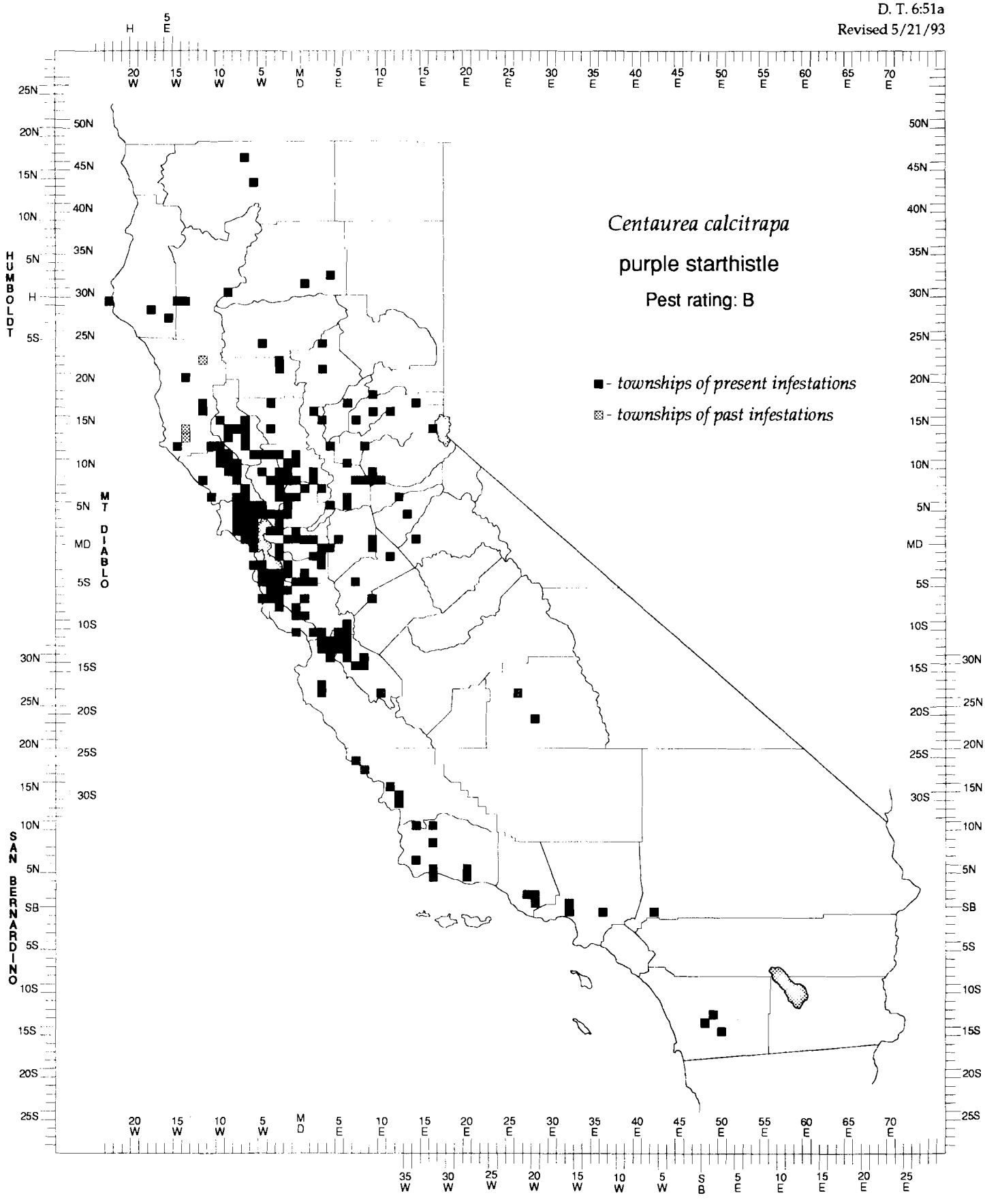
DETECTION MANUAL
D. T. 6:50a
Revised 5/21/93



STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

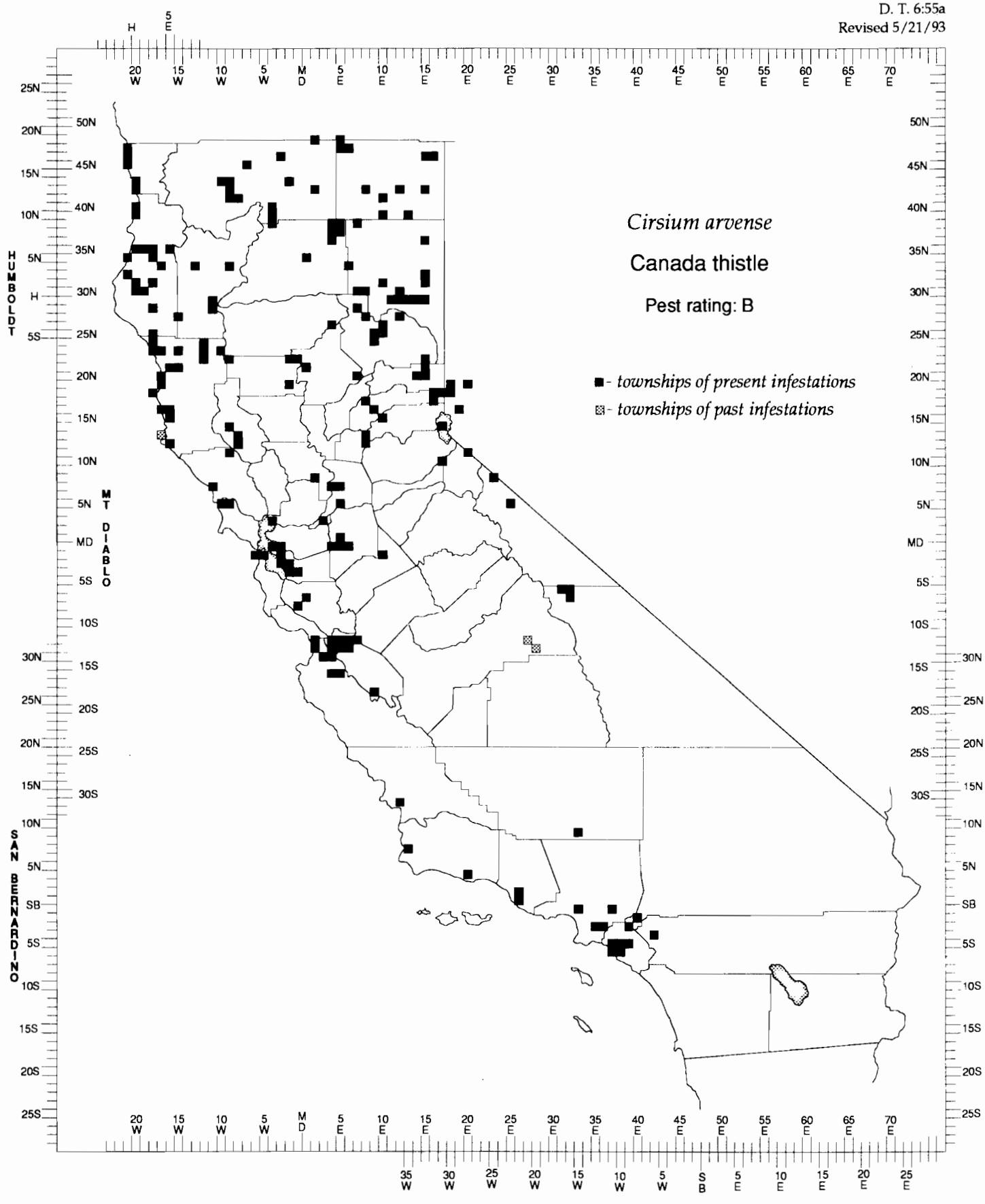
DETECTION MANUAL
D. T. 6:51a
Revised 5/21/93



STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

DETECTION MANUAL
D. T. 6:55a
Revised 5/21/93

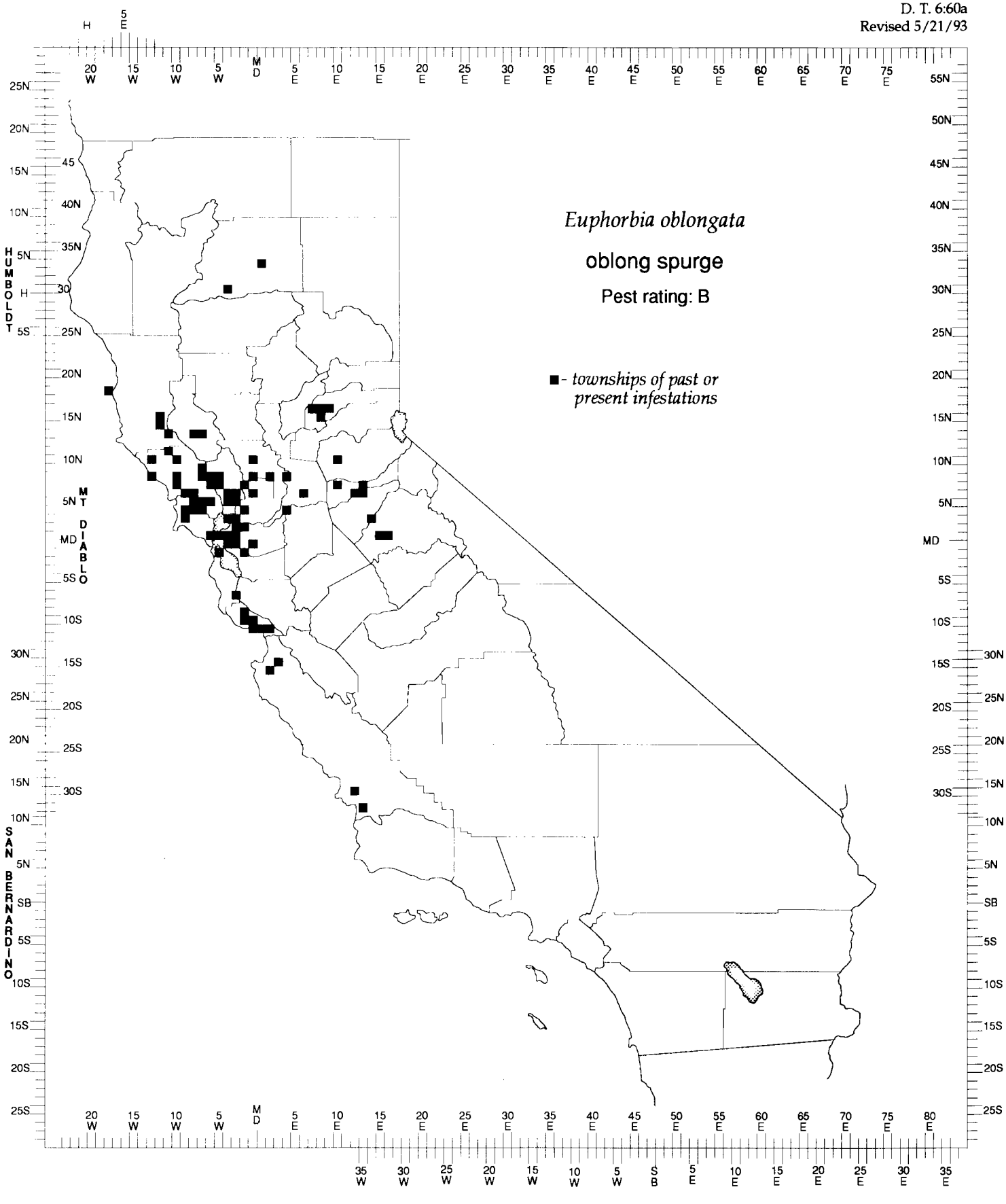


STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

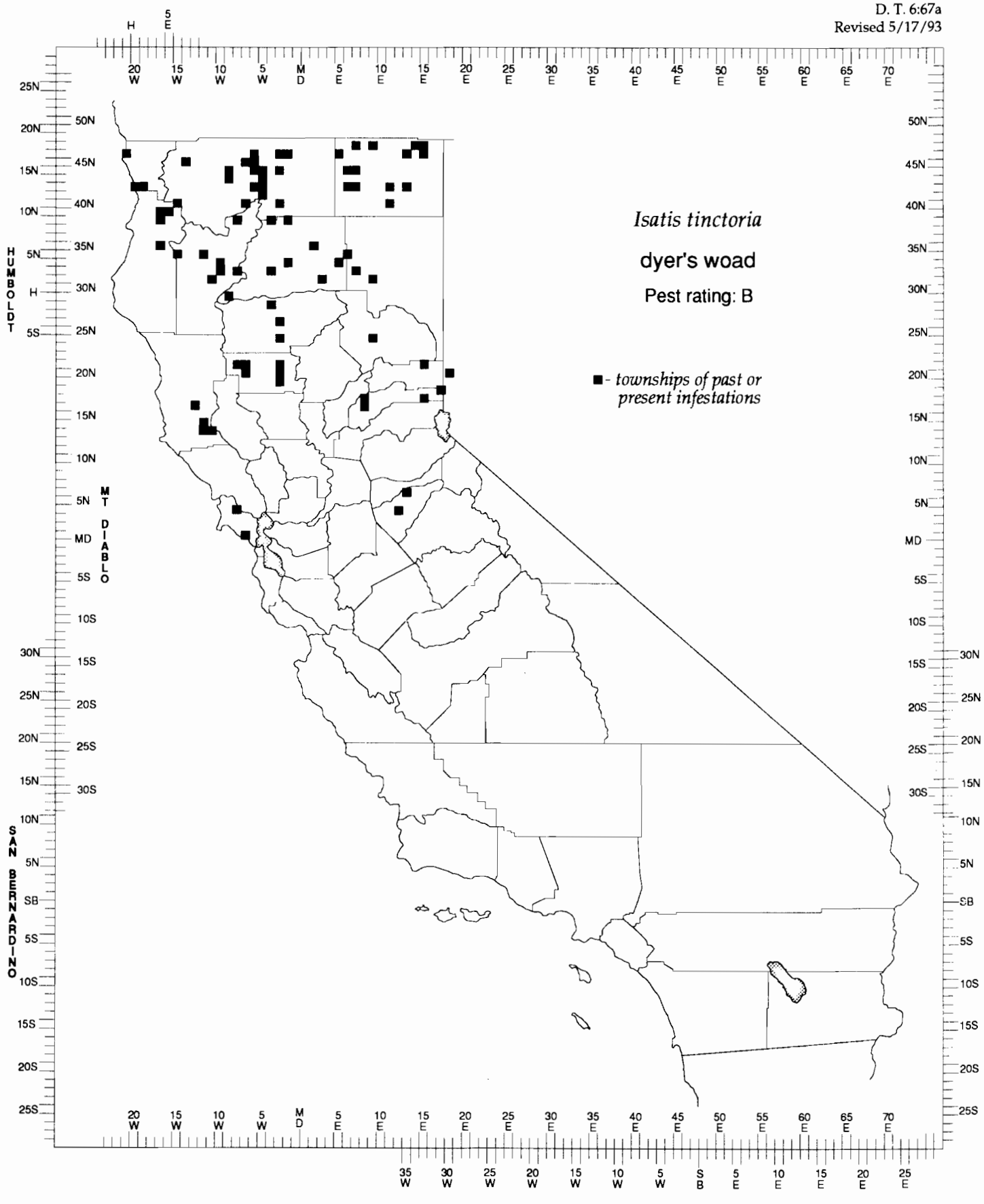
DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

36

DETECTION MANUAL
D. T. 6:60a
Revised 5/21/93



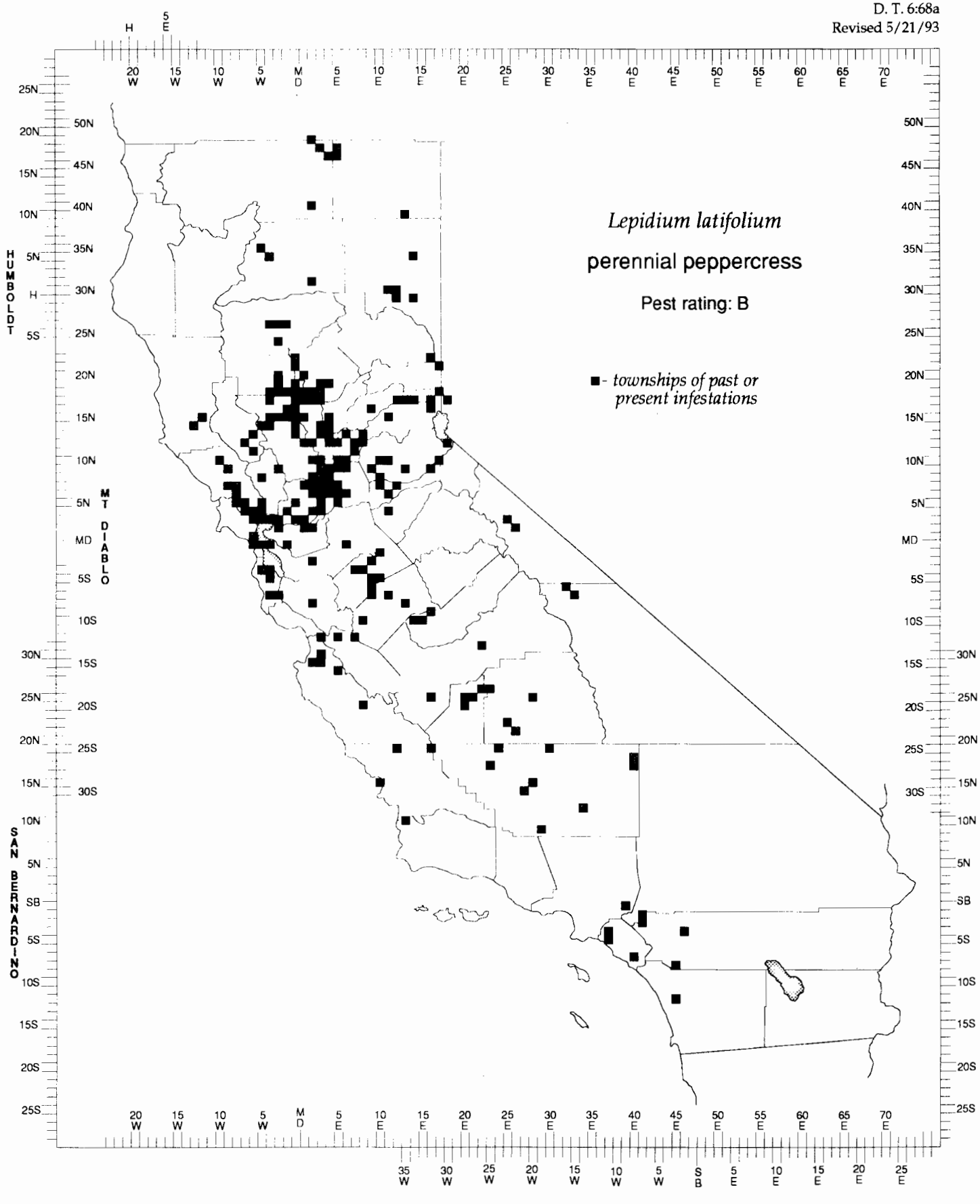
DETECTION MANUAL
D. T. 6:67a
Revised 5/17/93



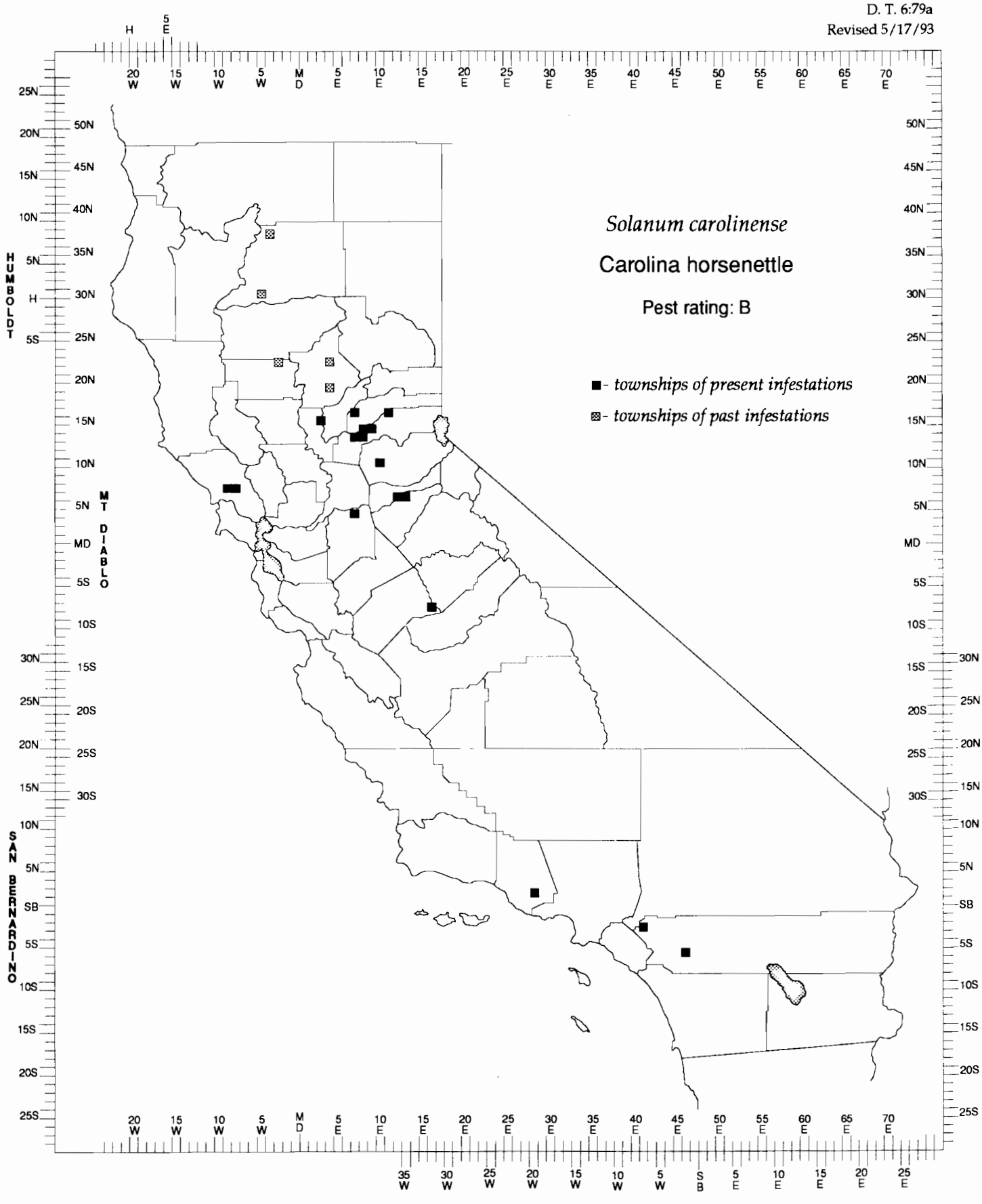
STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

DETECTION MANUAL
D. T. 6:68a
Revised 5/21/93



DETECTION MANUAL
D. T. 6:79a
Revised 5/17/93

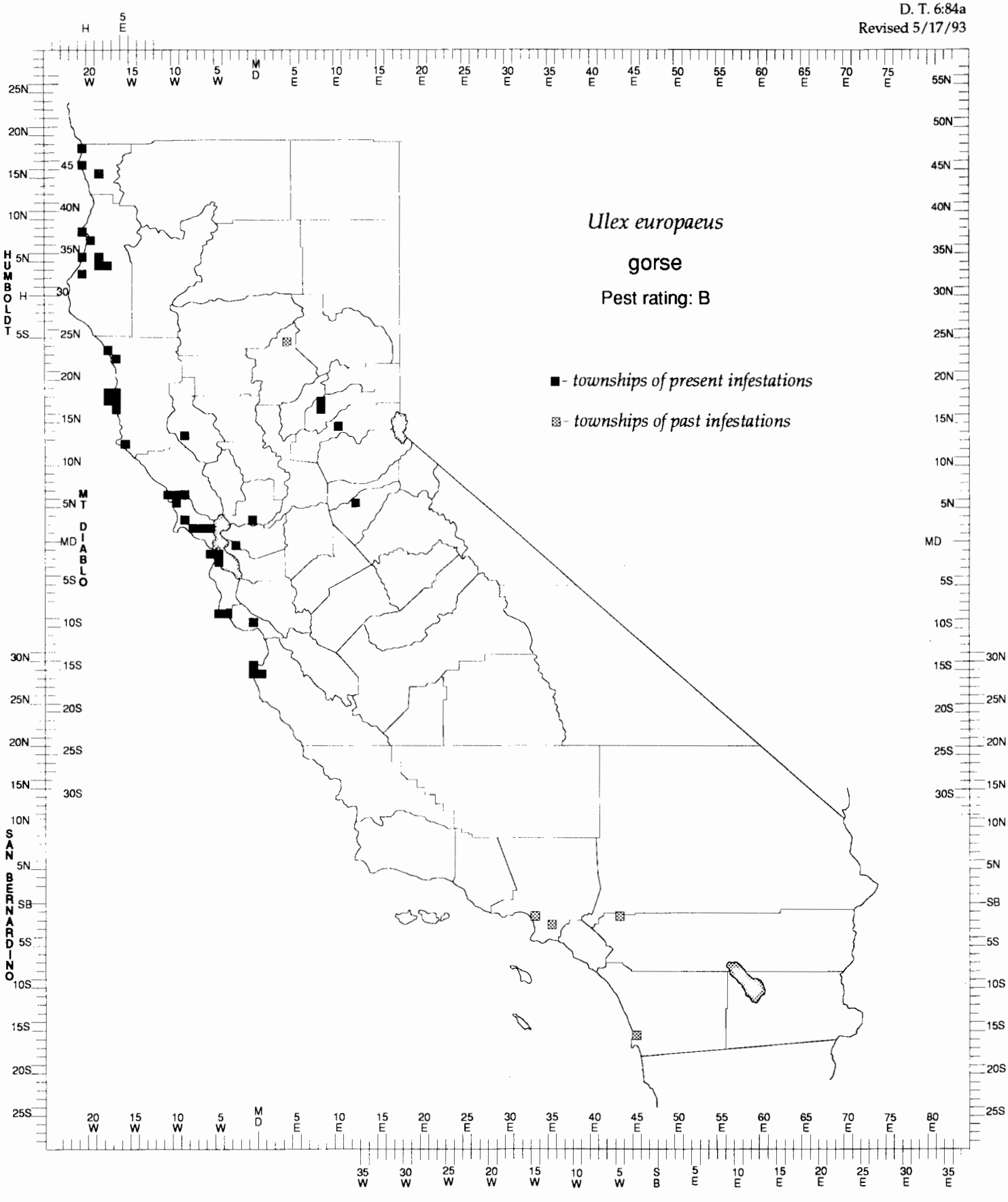


STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY - ANALYSIS & IDENTIFICATION/BOTANY

40

DETECTION MANUAL
D. T. 6:84a
Revised 5/17/93



NEMATOLOGY HIGHLIGHTS

NEMATODE PEST RATING LISTS

It is the general policy of the Department of Food and Agriculture to assign a pest rating to those organisms which could have economic effects on the agricultural systems of the state. In brief, the following guidelines are the basis for these pest ratings and in turn the meaning of each rating is discussed. The pest rating list has recently been revised for the nematodes of concern to California, and it will be included on the next several pages for the particular use of the Agricultural Commissioners. The list is in two parts, alphabetically by species, and in order by rating. The list is included here at the end of this issue so that the pages may be removed and used separately as needed.

Plant Industry
Guidelines for Establishing or Changing Pest Ratings

I. GENERAL PRINCIPLES

Section 403 of the California Food and Agricultural Code mandates that, "The department shall prevent the introduction and spread of injurious insect or animal pests, plant diseases, and noxious weeds." This statutory duty requires a pest policy which recognizes that organisms vary as to their potential and actual harm to California's agriculture and environment. Overall pest significance is the basis for determining what pest prevention activities are appropriate, at what level, and when and where those activities should be conducted.

A. Pest ratings are intended as aids to inform county agricultural commissioners and other interested persons as to a particular pest's environmental, agricultural and biological significance, as well as its importance to the general public, and the action recommended by the Department to deal with the pest.

B. Each pest rating represents the Department's view of the statewide importance of the pest to the agricultural, horticultural, forestry, and public health interests of California. Local conditions may dictate more stringent action against the same pest in individual counties at the discretion of the county agricultural commissioner.

C. It is the Department's policy to use the "Action Oriented Rating System". Pest ratings represent the Department's policy governing what action is to be taken consistent with existing statutes which include authority for: the promulgation of quarantine, eradication, control, standards of cleanliness, and other regulations; holding and inspection; establishing host-free, weed-free, and special pest control districts; and for other regulatory activities.

II. ACTION ORIENTED RATING SYSTEM

DEFINITIONS

"A" An organism of known economic importance subject to state (or commissioner when acting as a state agent) enforced action involving: eradication, quarantine regulation, containment, rejection, or other holding action.

"Q" An organism or disorder requiring a temporary "A" action pending determination of a permanent rating. The organism is suspected to be of economic importance but its status is uncertain because of incomplete identification or inadequate information.

In the case of an established infestation, at the discretion of the Director, the Department may conduct surveys and may convene the Division Pest Study Team to determine a permanent rating.

"B" An organism of known economic importance subject to: eradication, containment, control or other holding action at the discretion of the individual county agricultural commissioner.

or

An organism of known economic importance subject to state endorsed holding action and eradication only when found in a nursery.

"C" An organism subject to no state enforced action outside of nurseries except to retard spread. At the discretion of the county agricultural commissioner.

or

An organism subject to no state enforced action except to provide for pest cleanliness in nurseries.

"D" No action. (Parasites, predators, and organisms of little or no economic importance).

Nematode Pest Rating List
(aphabetically by species)

Species	Common Name	Rating
Anguina agrostis	bentgrass nematode	C
Anguina amsinckia	a seed gall nematode	D
Anguina balsamophila	a seed gall nematode	D
Anguina tritici	wheat nematode	C
Aphelenchoides besseyi	strawberry summer dwarf nematode	A
Aphelenchoides composticola	a fungus-feeding nematode	D
Aphelenchoides fragariae	strawberry spring dwarf nematode	C
Aphelenchoides ritzemabosi	chrysanthemum foliar nematode	C
Atalodera lonicerae	no common name known	D
Atalodera ucri	no common name known	D
Bakernema variabile	a spine nematode	D
Belonolaimus longicaudatus	a sting nematode	A
Belonolaimus spp.	sting nematode	A
Bursaphelenchus mucronatus	a pine wood nematode	Q
Bursaphelenchus xylophilus	pinewood nematode	C
Cacopaurus spp.	sessile nematode	D
Cactodera cacti	cactus cyst nematode	D
Criconema sp.	spine nematode	D
Criconemella axeste	a ring nematode	D
Criconemella curvata	a ring nematode	D
Criconemella macrodora	a ring nematode	D
Criconemella parva	a ring nematode	D
Criconemella xenoplax	a ring nematode	D
Criconemoides spp.	ring nematode	D
Crossonema fimbriatum	a spine nematode	D
Ditylenchus destructor	potato rot nematode	B
Ditylenchus dipsaci	stem and bulb nematode	C
Ditylenchus intermedius	a bulb and stem nematode	D
Dolichodorus heterocephalus	Cobb's awl nematode	A
Dolichodorus spp.	awl nematode	D
Globodera pallida	white cyst potato nematode	A
Globodera rostochiensis	golden nematode	A
Gracilacus spp.	a pin nematode	D
Helicotylenchus spicaudatus	spiral nematode	D
Helicotylenchus spp.	spiral nematode	D
Hemicriconemoides spp.	sheathoid nematode	D
Hemicycliophora arenaria	a sheath nematode	A
Hemicycliophora megalodiscus	sheath nematode	D
Hemicycliophora spp.	sheath nematode	D
Heterodera avenae	oat cyst nematode	A
Heterodera cruciferae	cabbage cyst nematode	C
Heterodera fici	fig cyst nematode	D
Heterodera glycines	soybean cyst nematode	A
Heterodera mani	a grass cyst nematode	Q
Heterodera schachtii	sugar beet cyst nematode	C
Heterodera trifolii	clover cyst nematode	D
Hirschmanniella belli	a rice root nematode	D
Hirschmanniella caudacrena	a rice root nematode	D
Hirschmanniella gracilis	a rice root nematode	D
Hirschmanniella oryzae	rice root nematode	A
Hoplolaimus spp.	lance nematode	D

Longidorus africanus	no common name known	C
Longidorus spp.	needle nematode	D
Merlinius brevidens	a stunt nematode	D
Merlinius conicus	a stunt nematode	D
Merlinius grandis	a stunt nematode	D
Merlinius superbus	a stunt nematode	D
Nacobbus aberrans	sugar beet false root-knot nematode	A
Nacobbus dorsalis	false root-knot nematode	C
Nothocriconema mutabile	a ring nematode	D
Nothocriconema permistum	a ring nematode	D
Paralongidorus microlaimus	a needle nematode	C
Pararotylenchus sp.	a spiral nematode	D
Paratrichodorus allius	a stubby-root nematode	D
Paratrichodorus minor	Christie's stubby-root nematode	D
Paratrichodorus porosus	a stubby-root nematode	D
Paratrichodorus renifer	a stubby-root nematode	D
Paratylenchus spp.	pin nematode	D
Pratylenchus alleni	a lesion nematode	Q
Pratylenchus brachyurus	smooth-headed lesion nematode	C
Pratylenchus coffeae	coffee lesion nematode	C
Pratylenchus convallariae	a lesion nematode	D
Pratylenchus crenatus	a lesion nematode	D
Pratylenchus flakkensis	a lesion nematode	Q
Pratylenchus goodeyi	a lesion nematode	D
Pratylenchus hexincisus	a lesion nematode	D
Pratylenchus minyus	a lesion nematode	D
Pratylenchus neglectus	a lesion nematode	D
Pratylenchus penetrans	Cobb's lesion nematode	C
Pratylenchus pratensis	a lesion nematode	D
Pratylenchus scribneri	a lesion nematode	D
Pratylenchus thornei	a lesion nematode	D
Pratylenchus vulnus	walnut lesion nematode	C
Pratylenchus zeae	corn lesion nematode	C
Quinisulcius acutus	a stunt nematode	D
Quinisulcius capitatus	a stunt nematode	D
Radopholus similis	burrowing nematode	A
Rotylenchulus parvus	no common name known	C
Rotylenchulus reniformis	reniform nematode	A
Rotylenchus spp.	spiral nematode	D
Sarisodera hydrophylla	no common name known	D
Scutellonema spp.	spiral nematode	D
Trichodorus spp.	stubby-root nematode	D
Tylenchorhynchus spp.	stunt nematode	D
Tylenchulus semipenetrans	citrus nematode	C
Xiphinema americanum	American dagger nematode	C
Xiphinema bakeri	a dagger nematode	C
Xiphinema brasiliense	a dagger nematode	Q
Xiphinema brevicolle	a dagger nematode	C
Xiphinema chambersi	Chamber's dagger nematode	Q
Xiphinema coxi	a dagger nematode	C
Xiphinema diversicaudatum	European dagger nematode	A
Xiphinema index	California dagger nematode	B
Xiphinema insigne	a dagger nematode	C
Xiphinema setariae	a dagger nematode	Q
Xiphinema vuittenezi	a dagger nematode	C
Xiphinema vulgarae	a dagger nematode	Q

Nematode Pest Rating List (by rating)

Species	Common Name	Rating
Aphelenchoides besseyi	strawberry summer dwarf nematode	A
Belonolaimus longicaudatus	a sting nematode	A
Belonolaimus spp.	sting nematode	A
Dolichodorus heterocephalus	Cobb's awl nematode	A
Globodera pallida	white cyst potato nematode	A
Globodera rostochiensis	golden nematode	A
Hemicycliophora arenaria	a sheath nematode	A
Heterodera avenae	oat cyst nematode	A
Heterodera glycines	soybean cyst nematode	A
Hirschmanniella oryzae	rice root nematode	A
Nacobbus aberrans	sugar beet false root-knot nematode	A
Radopholus similis	burrowing nematode	A
Rotylenchulus reniformis	reniform nematode	A
Xiphinema diversicaudatum	European dagger nematode	A
Bursaphelenchus mucronatus	a pine wood nematode	Q
Heterodera mani	a grass cyst nematode	Q
Pratylenchus alleni	a lesion nematode	Q
Pratylenchus flakkensis	a lesion nematode	Q
Xiphinema brasiliense	a dagger nematode	Q
Xiphinema chambersi	Chamber's dagger nematode	Q
Xiphinema setariae	a dagger nematode	Q
Xiphinema vulgarae	a dagger nematode	Q
Ditylenchus destructor	potato rot nematode	B
Meloidogyne chitwoodi	Columbia root-knot nematode	B
Meloidogyne naasi	barley root-knot nematode	B
Xiphinema index	California dagger nematode	B
Anguina agrostis	bentgrass nematode	C
Anguina tritici	wheat nematode	C
Aphelenchoides fragariae	strawberry spring dwarf nematode	C
Aphelenchoides ritzemabosi	chrysanthemum foliar nematode	C
Bursaphelenchus xylophilus	pinewood nematode	C
Ditylenchus dipsaci	stem and bulb nematode	C
Heterodera cruciferae	cabbage cyst nematode	C
Heterodera schachtii	sugar beet cyst nematode	C
Longidorus africanus	no common name known	C
Meloidogyne graminis	a root-knot nematode	C
Meloidogyne spp.	root-knot nematode	C
Nacobbus dorsalis	false root-knot nematode	C
Paralongidorus microlaimus	a needle nematode	C
Pratylenchus brachyurus	smooth-headed lesion nematode	C
Pratylenchus coffeae	coffee lesion nematode	C
Pratylenchus penetrans	Cobb's lesion nematode	C
Pratylenchus vulnus	walnut lesion nematode	C
Pratylenchus zeae	corn lesion nematode	C
Rotylenchulus parvus	no common name known	C
Tylenchulus semipenetrans	citrus nematode	C
Xiphinema americanum	American dagger nematode	C
Xiphinema bakeri	a dagger nematode	C
Xiphinema brevicolle	a dagger nematode	C
Xiphinema coxi	a dagger nematode	C
Xiphinema insigne	a dagger nematode	C
Xiphinema vuittenezi	a dagger nematode	C
Anguina amsinckia	a seed gall nematode	D
Anguina balsamophila	a seed gall nematode	D

Aphelenchoides composticola	a fungus-feeding nematode	D
Atalodera lonicerae	no common name known	D
Atalodera ucri	no common name known	D
Bakernema variabile	a spine nematode	D
Cacopaurus spp.	sessile nematode	D
Cactodera cacti	cactus cyst nematode	D
Criconema sp.	spine nematode	D
Criconemella axeste	a ring nematode	D
Criconemella curvata	a ring nematode	D
Criconemella macrodora	a ring nematode	D
Criconemella parva	a ring nematode	D
Criconemella xenoplax	a ring nematode	D
Criconemoides spp.	ring nematode	D
Crossonema fimbriatum	a spine nematode	D
Ditylenchus intermedius	a bulb and stem nematode	D
Dolichodorus spp.	awl nematode	D
Gracilacus spp.	a pin nematode	D
Helicotylenchus spicaudatus	spiral nematode	D
Helicotylenchus spp.	spiral nematode	D
Hemicriconemoides spp.	sheathoid nematode	D
Hemicycliophora megalodiscus	sheath nematode	D
Hemicycliophora spp.	sheath nematode	D
Heterodera fici	fig cyst nematode	D
Heterodera trifolii	clover cyst nematode	D
Hirschmanniella belli	a rice root nematode	D
Hirschmanniella caudacrena	a rice root nematode	D
Hirschmanniella gracilis	a rice root nematode	D
Hoplolaimus spp.	lance nematode	D
Longidorus spp.	needle nematode	D
Merlinius brevidens	a stunt nematode	D
Merlinius conicus	a stunt nematode	D
Merlinius grandis	a stunt nematode	D
Merlinius superbus	a stunt nematode	D
Nothocriconema mutabile	a ring nematode	D
Nothocriconema permistum	a ring nematode	D
Pararotylenchus sp.	a spiral nematode	D
Paratrichodorus allius	a stubby-root nematode	D
Paratrichodorus minor	Christie's stubby-root nematode	D
Paratrichodorus porosus	a stubby-root nematode	D
Paratrichodorus renifer	a stubby-root nematode	D
Paratylenchus spp.	pin nematode	D
Pratylenchus convallariae	a lesion nematode	D
Pratylenchus crenatus	a lesion nematode	D
Pratylenchus goodeyi	a lesion nematode	D
Pratylenchus hexincisus	a lesion nematode	D
Pratylenchus minyus	a lesion nematode	D
Pratylenchus neglectus	a lesion nematode	D
Pratylenchus pratensis	a lesion nematode	D
Pratylenchus scribneri	a lesion nematode	D
Pratylenchus thornei	a lesion nematode	D
Quinisulcius acutus	a stunt nematode	D
Quinisulcius capitatus	a stunt nematode	D
Rotylenchus spp.	spiral nematode	D
Sarisodera hydrophylla	no common name known	D
Scutellonema spp.	spiral nematode	D
Trichodorus spp.	stubby-root nematode	D
Tylenchorhynchus spp.	stunt nematode	D